# The IRON AGE

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# *Another Red Herring*

IN the current controversy over inflation one argument has been permitted to stand largely by default. It is contended that the modest tax relief provided by Congress during the last year is among the major causes of high living costs.

This is an attitude toward tax relief shared by many people who are free from political motivation, whose intellectual honesty is unquestioned. The absorption of surplus income, the elimination of the so-called inflation gap has crept increasingly into fiscal thinking. During the war, the Treasury regularly supplied Congress with information regarding aggregate disposable consumer income and estimates of available goods—the object to needle Congress for higher tax levels.

The argument that taxation should be used as an instrument for the control of inflation is fallacious and mischievous.

It is fallacious because the exaction of a bigger tax bite out of individual income does not reduce the total of purchasing power It merely transfers the right of expenditure from the person who earns the income to a government functionary The assumption that such a functionary will spend money more wisely than the man who earns it is hardly borne out by experience There is not an iota of direct valid evidence acceptable for honest inductive reasoning that the price of hamburger is high because workers have obtained a little tardy tax relief.

The argument is mischievous for a number of reasons: Lower taxes as a cause of inflation diverts attention from authentic causes. Like the charges that installment credit and bank loans have caused groceries to mount, it draws "a red herring" across the price trail.

The use of taxation to control prices is a perversion of the tax function. The state levies taxes in order to pay its bills. This is the real and only legitimate purpose of taxation. When a tax becomes an instrument for regulating the economy, redistributing income, or penalizing the successful it becomes a menace to free institutions.

Furthermore, it is a matter of horse sense prudence to keep the legislature under constant fiscal pressure. Expenditures should be forced within the definite limitations of normal income, else the incentive to economize vanishes. If revenues are increased solely because this is deemed an inflation corrective, Congress will speedily find ways to squander the excess income and by the same token ignore the real causes of inflation.

Finally, ample fiscal experience proves beyond any doubt that higher taxes to lower prices will fail to check precisely those groups who may be bidding up prices. The average American now eats about 25 pounds more meat per year than he did before the war. This increase is the result largely of changing diets in lower income groups. It is all to the good even if it does increase the demand for meat. We know, however, that changes in the tax pattern resulting from higher rates will merely hit top bracket incomes and leave relatively undisturbed those incomes which account for greater food demand.

Lower taxes are not the cause of higher food prices—nor will a rise in levies reduce the price of potatoes.

*Joseph Stagg Lawrence*

► Aggregate cost of the steel industry's current construction program is $1.7 billion, according to a leading steel official. This amount, he points out, is equal to approximately 25 pct of the cost of all the industry's facilities and 60 pct of their present depreciated book value.

► An all new design diesel engine is now undergoing experimental runs. The engine block, head, etc. consist of steel stampings which have been joined by brazing. The engine is of the type and size found in many truck and farm implement applications.

► Scrap dealers and brokers are puzzled. Inspection of boatloads of German scrap which has hit this country thus far reveals that the scrap is of exceptionally good quality. Furthermore, instead of war material such as tanks, armor plate etc., it consists to great extent of industrial material such as rails, structurals and even good casting grades.

► The government is taking a licking in disposing of war surplus property. Recently WAA was offered a ridiculously low sum for a Garland, Tex. plant which originally cost $2 million. A New York auctioneering firm finally disposed of it for $611,000. WAA has thus concluded that even at this rate they are better off and have decided to use such firms in the future to auction off the balance of plants slated for disposal.

► With the new high compression automobile engines have come new and more difficult problems for the engineer and materials specialist. Certain parts of the new high compression engines are stressed 100 pct in excess of the same parts in conventional automobile engines.

► In the event of another war -- alloy steel demand would be much greater than it was in World War II. But if present plans are carried out, by 1950 the steel industry's electric furnace capacity will be at least 15 pct above the last war's peak.

► The scrap situation is no joke. But it did take a humorous twist at the Ford Motor Co. plant recently when workers began unloading a car of the best No. 1 heavy melting scrap Ford has seen for some time. After taking off the top layer, they ran into a carload of meat -- in cans, of course. Needless to say, the carload was rejected.

► There is a lot of interest these days in the development of titanium metal. But contrary to prevailing ideas, the real interest in producing the titanium metal, besides developing economic methods for its manufacture, is to get enough of the metal for experimental purposes in developing titanium-base alloys. It is believed that the development of these alloys will be a time consuming task much along the lines of the development of steel. It is expected, however, that some day commercial titanium-base alloys will take their place right alongside steel.

► Some French industrialists are really miffed. That ECA allocations are not anywhere near the country's steel requirements is one thing. But what they point to in anguish is the fact that France is not building up a dollar reserve with which she can develop modern American techniques in steel manufacture. They are not developing the use of oxygen in blast furnaces, nor new sintering or concentrating plants for iron ores. And above all, they don't even know yet where the second continuous or semicontinuous hot strip mill provided for in the modernization program is going to be located.

► Use of transfer machines is not by far the only technical advance auto makers have adopted in their efforts to increase production, improve quality and cut costs. Informed sources say that some of the new techniques in die work, particularly with large dies, will surpass anything the industry has ever done in the past.

► Britain and United States have reached an agreement on the German scrap divy, at least temporarily. Original first round allocations of 300,000 tons for Britain, 200,000 tons for the United States and 100,000 tons for other countries was confirmed. In addition to that, the United States was granted another 100,000 to equal the amount Britain gets.

Beyond that Britain will get an extra 75,000 tons booty free and the United States 75,000 to be paid for. There will also be another 125,000 for Britain, the United States and other countries to be charged to future allocations. All foreign buyers will pay a uniform price for the same type of scrap from the same loading place.

# Who Discovered Stainless Steel?

IN the course of preparing a text on stainless steels, the historical background of these interesting alloys was examined in detail by consulting original documents. To the considerable astonishment of the author, the traditional credits for discovery were found to be at marked variance with recorded facts—facts readily available, but apparently overlooked or ignored, not only by writers of current articles and texts touching on the history, but by the actual characters themselves involved in the turmoil and patent litigation of this prize among metallurgical achievements.

L. Guillet, discoverer of martensitic, ferritic and austenitic compositions (1902-1906).

Tradition, for example, has us look back to the period 1912 to 1915 with Brearley in England and Strauss and Maurer in Germany for the genesis of stainless steel.

As a matter of available published record, the exact steels promoted by these men, along with numerous other grades among the standard designations of today, were produced, tested and described in much detail by others years before them, as was the phenomenon of passivity in relation to the corrosion resistance of these alloys. Further, witness is given that Strauss does not deserve placement with Maurer and Brearley on either basis.

Perhaps Brearley and Maurer discovered the industrial usefulness of these steels—they certainly unfolded their vast commercial aspects—but they did not discover either the steels, their feature of passivity, or the primary metallurgical attributes concerning either their thermal or their mechanical handling.

More properly, as will be shown here, these steels were discovered by Guillet, also perhaps Portevin, in France, by Monnartz in Germany, and by Giesen in England in the period 1903 to 1910; recognition and exploitation of their unusual commercial attributes was probably initiated by Brearley in England and by Maurer in Germany in the period 1912 to 1915, also by others in America; but even that claim is weakened by the patent applications of Woods and Clark in England 40 years earlier, and of Monnartz and Borchers in Germany in 1910, also the work of Dantsizen in America in 1911.

To make certain that this surprising breach really exists between record and tradition, the author carefully selected six authorities on stainless steel in this country and invited them to name; (1) six men who, in their opinion, played

***"There is little question but that this article will blast loose many long-suppressed feelings and previously unpublished information on what was obviously a situation as replete with brilliant acting in some quarters, and with envying, coveting and conniving in others, as any in the history of metallurgy," was the prediction of an eminent metallurgist after reviewing this manuscript. While this thought-provoking article does destroy many popular myths concerning the discovery of stainless steels, it is based entirely on factual information in published records.***

By CARL A. ZAPFFE
*Baltimore*

the greatest roles in the discovery of stainless steel, and (2) another six believed to be the world's outstanding contemporaries. Three of these authorities belonged on this latter list themselves; three did not, their positions being as users of long training, rather than as contributors to the art. The companies represented by the six men included: (1) two of the outstanding producers of stainless steel in this country, (2) the principal manufacturer of ferroalloys, (3) the principal producer of nickel, and (4) one of the leading fabricators of stainless steel equipment. Their names will not be revealed in deference to the fact that they ventured their opinions unofficially, and only as opinions.

In table I, the honor roll compiled from their nominations must provide a fair representation of the best tradition. Note that: Not one of the discoverers to be verified as such in this report is named in any part of the table; and Strauss is unanimously accepted as a co-discoverer with Maurer in spite of strong published witness to the contrary.

While no pretense is to be made here of rendering a final judgment in the matter—that must be left to later and more thorough students—it is of warranted importance to a true historical background that those who actually discovered the steels be so credited. This can be done tentatively and rather effectively, with avoidance of mere personal opinion, by referring to several published records which seem to have been overlooked by previous historians.

Briefly, the story of the discovery of stainless steel can be divided among three rather clearly defined stages:

(1) Discovery of low chromium steel, too low in chromium content to be stainless.

(2) Discovery of high chromium steel, too high in carbon content to be stainless.

(3) Discovery of the basic modern alloys.

In honor of the men who recognized the vast industrial aspects of the alloys and initiated their wide usage, an auxiliary stage can be added:

(3A) Discovery of the industrial significance of stainless steel.

## Low-Chromium Steel

One and one-half centuries have now passed since Vauquelin produced chromium metal from chromium ore[1]; and almost as long a period has

A. M. Portevin, early French explorer of modern stainless compositions (1907-1912).

elapsed since Stodart and the great English scientist, Michael Faraday, first alloyed chromium with iron.[2, 4] That English investigation started a 90-year trek to stainless steel.

In France, Berthier immediately followed Faraday's lead[3]; and it is interesting to read that this investigator in 1821 comments on the increased corrosion resistance and increased hardness of the alloys and recommends them for cutlery. Although Berthier also made ferrochromium, the chromium content of his steels was only in the order of 2 or 3 pct.

In 1838, Mallet[5] described the increased corrosion resistance of iron containing chromium; and, allowing chronology to take us for a moment to the very high chromium ranges, Berthier[3] in 1821, Bunsen[6] in 1854, Deville[7] in 1856, Fremy[8] in 1857, and Wohler[9] in 1859, among others,[17] recorded that ferrochromium and chromium metal itself resisted strong acids, including aqua regia.

So far as steels are concerned, however, the investigators in this period virtually restricted themselves to chromium contents of only a few percent. Besides this, the alloys were high in carbon—an inevitable and condemning feature of all the early research. The disclosures on corrosion resistance were obscured by occasional investigators unhappily choosing to test the chromiferous steel in salt water, hydrochloric acid, or sulfuric acid[4, 19, 27] which media it resists particularly poorly.

Although these early researches warrant only passing mention, one cannot leave the era of low chromium steel without recording an anecdote about Baur's Chrome Steel Works in Brooklyn. This adventuring gentleman patented chromium steel in 1865[11] and manufactured a product in 1869 which was advertised as a high-strength steel for burglar-proof safes and cells. His literature carried a picture of a dejected convict behind "chrome steel" bars, with the caption: "The Jail-Breakers Catechism."

Obvious confusion with the word "cataclysm" prepares the reader to hear strange things about Baur; and the great American metallurgist, H. M. Howe, spent many paragraphs in his classic text[26] repudiating Baur's claims, to the point of maintaining that no chromium could be found even in the slag of the Brooklyn Steel Works! The controversy reached the newspapers when Baur was widely advertised to have supplied chromium steel for the famous bridge built by Capt. J. D. Eads spanning the Mississippi River at St. Louis. Exaggerated claims were long made for the steel in that bridge[12, 25] ranging down to a published report that a special analysis could find no chromium in any part of its structure[14, 26]; although Thum, writing many years later,[51] supplied analyses showing the main arch members to contain 0.54 to 0.68 pct Cr, along with carbon contents up to 0.95 pct.

In 1875, a great French contributor to the art, Brustlein, began his investigations as a result of current stories about Baur; and between 1877 and 1886 Brustlein initiated the use of steel containing a few percent of chromium in munitions and armaments in France.[18, 20, 23] That venture, by contrast to Baur's, was without suspicion. Brustlein was a true pioneer in the field and was probably the first to recognize the cooperative importance of chromium and carbon, at least so far as mechanical properties were concerned. Howe[26] reports a rather large production of chromium-containing steel at Brustlein's plant, Messrs. Holtzer and Co. at Unieux, France, in this period. Howe also points to its production in Sheffield, England.

### TABLE I

The Honor Roll for Stainless Steel According to Popular Opinion

Tabulation of votes from six judges.

| DISCOVERERS | | CONTEMPORARIES | |
|---|---|---|---|
| Votes | Name | Votes | Name |
| 6 | Brearley, H. | 4 | Bain, E. C. |
| 6 | Strauss, B. | 4 | Feild, A. L. |
| 6 | Maurer, E. | 4 | Franks, R. |
| 5 | Haynes, E. | 3 | Aborn, R. H. |
| 4 | Becket, F. M. | 3 | Monypenny, W. H. G. |
| 3 | Johnson, C. M. | | |
| 2 Votes | | Men Sharing Column 1 | |
| | Armstrong, P. A. E.<br>Dantsizen, C. | 2 | Becket, F. M. |
| | | 1 | Armstrong, P. A. E. |
| 1 Vote | | 1 | Hatfield, W. H. |
| | Berthier, P.<br>Hatfield, W. H.<br>Vauquelin, L. N. | 1 | Johnson, C. M. |
| | | 2 Votes | |
| | | | Browne, V. B.<br>Houdremont, E.<br>Krivobok, V. N.<br>Palmer, F. R.<br>Schafmeister, P. |
| | | 1 Vote | |
| | | | Fleischmann, M.<br>Grossman, M.<br>Kiefer, G.<br>Newell, H. D.<br>Payson, P. |

### High-Chromium, High-Carbon Steel

In the half-century following Stodart and Faraday's and Berthier's pioneering, near misses to discovering stainless steel appear strikingly numerous. Clearly they followed from the great difficulty in avoiding high carbon contents, also from the continued restriction of the investigations to very low and to very high chromium contents. The intermediate range comprising the stainless steels was, to a great extent by chance, not explored.

In the latter part of the last century, however, that range was explored, whereupon the failure of discovery becomes more surprising. Beginning about the time of the Civil War, Percy, in England, adapted the ferrochromium process to the crucible furnace and produced for the first time in that country iron-chromium alloys rich in chromium. They contained 4, 27, 54, and 76 pct Cr,[10] the second alloy being a hit in the present stainless range (12 to 30 pct Cr) except for carbon content. He described the magnetic properties as marked at 4 and 27 pct Cr, and absent in the alloys having higher chromium content; but he went no further.

In the 1870's the art of ferrochromium manufacture advanced strongly with this introduction

to the crucible furnace,[15] and also with its introduction to the blast furnace.[16, 17, 26] In 1878 the Terre Noire Co. was producing a "chromiferous spiegeleisen" with 25 pct Cr and 13 pct Mn.[22, 24] Such a material borders on present stainless composition, again neglecting carbon content.

In 1872, Woods and Clark[13] applied for a British patent on an acid- and weather-resisting alloy containing 30 to 35 pct Cr and 1.5 to 2.0 pct W. No record has come to the author's attention that this patent was ever either granted or put into practice; but the fact of the claim deserves consideration when giving credits to men for introducing stainless steel as an industrial material 40 years later. Undoubtedly the alloys suffered from high carbon content, although the tungsten may have protected the chromium content in a manner suggestive of modern "stabilization."

But even the carbon impediment was soon removed. In Sweden in 1886, the carbon content of ferrochromium was held to lower values by melting in a specially designed furnace[21]; and in 1895 Goldschmidt, in Germany, produced low carbon ferrochromium and chromium metal by aluminothermic reduction,[28] a process in use today.

Shortly before this, in 1886, Boussingault had made a special point of the greater corrosion resistance of steel containing chromium[17] and had resorted to potassium sulfate for the etching of ferrochromium—a technique later adopted by Guillet. At last, in 1898, Carnot and Goutal drew attention to the fact that the corrosion resistance of iron-chromium alloys depends largely upon the carbon content.[29] As for the analytical chemist of that day, it was common knowledge that ferrochromium could not be dissolved with ordinary acids, as has been pointed out.

Reading the record at this enlightened date, one cannot resist expressing some surprise that "stainless steel" was not discovered before the turn of the century. If not by the steelmaker or the chemist, how about the metallographer experiencing etching difficulties?

In 1892, Hadfield[27] explored alloys in the stainless range of chromium content containing up to 16.74 pct of that metal. However, he restricted his observations principally to alloys containing 1.18 to 9.18 pct Cr, which fall just short of the stainless range. Also, his steels in the stainless range contained from 1 to more than 2 pct C; and he unfortunately chose 50 pct sulfuric acid, an unfavorable solution, to test them. He next proceeded on the erroneous assumption, common at that time, that corrosion in sulfuric acid was representative of corrosion in general, and served therefore as an accelerated test.

As a result, Hadfield reached the conclusion that chromium impairs the corrosion resistance of steel! His monumental study with its unfortunate conclusions threatened to terminate interest in the alloys for years to come, except that the discoveries of Goldschmidt and Carnot and Goutal just mentioned shortly reopened the field with a new aspect—low carbon content.

## Modern Alloys

*Straight-chromium grades* (AISI 400 series)—Apparently the first to explore this new aspect of low-carbon iron-chromium alloys was Leon Guillet in France.

F. M. Becket, ferroalloy expert and pioneer in the commercialization of ferritic stainless alloys.

Guillet published in 1904, 1905, and 1906 a detailed study of iron-chromium alloys in the present stainless range which must represent work begun no later than 1902.[30, 31, 32, 33, 36] In 29 large and carefully written pages in one article,[30] he describes the heat treatment, microstructure, tensile properties, impact resistance, and hardness of 23 iron-chromium-carbon alloys, at least five of which fall within the limits of standard AISI analyses for both martensitic and ferritic grades today.

Guillet's alloys were made from aluminothermic chromium, with due regard for carbon content. Thirty-six photomicrographs are presented in one article[30]; and eight charts on mechanical properties, with four more added in an appendix in his book.[31] He describes the pearlite in the range up to 7 pct Cr; martensite—com-

TABLE II

Guillet's "400-Series" Stainless Steels in 1904

| Cr | C | Si | S | P | Mn | Corresponding AISI Type |
|---|---|---|---|---|---|---|
| 0.703* | | | Series I | | | |
| 0.703* | 0.043 | 0.971 | trace | 0.015 | trace | |
| 1.207* | 0.058 | 0.700 | | 0.016 | | |
| 4.502* | 0.214 | 0.232 | 0.008 | 0.020 | | (501) |
| 7.835* | 0.071 | 0.120 | 0.014 | 0.010 | | |
| 9.145* | 0.114 | 0.338 | 0.004 | 0.015 | | |
| 10.136* | 0.154 | 0.200 | 0.028 | 0.006 | | |
| 13.603 | 0.142 | 0.210 | 0.015 | 0.016 | | 410 |
| 14.522 | 0.382 | 0.469 | 0.011 | 0.013 | | 420 |
| 22.060 | 0.210 | 0.527 | trace | 0.011 | | 442 |
| 25.306 | 0.244 | 0.256 | 0.013 | 0.020 | 0.108 | 446 |
| 31.746* | 0.464 | 0.373 | 0.006 | 0.024 | trace | |
| | | | Series II (8 alloys)* | | | |
| 18.65 | 0.905 | 0.745 | 0.007 | 0.010 | | 440-C |
| | | | (3 alloys Cr 26-36, C 0.82-0.92*) | | | |

* Included to indicate the scope of the study.

A. L. Feild, inventor of the "Rustless melting process."

plete in the range of 10 to 13 pct, and continuing in a two-phase constitution up to 20 pct; and ferrite plus a "double carbide" above 13 pct, and particularly above 20 pct. He prepared two series of alloys, one with low carbon, one with high. The analyses of his alloys pertinent to this discussion are listed in table II.

From this table, one sees that Guillet's steels included the principal basic grades in both the martensitic and ferritic classes in use today. His alloy in Series I with 14.5 pct Cr and 0.38 pct C is the identical steel patented by Brearley more than 10 years later.[46, 47] The preceding alloy in the table, with 13.6 Cr, and 0.14 C, is within the AISI range today for type 410—the most popular of the modern hardenable stainless steels. The two following alloys in the table are exactly the present standard ferritic types 442 and 446 whose "discovery" was argued years later by Haynes, Becket, and others.

As for corrosion resistance, it is true that Guillet made no point of it. His efforts here were directed toward establishing the primary metallurgical and mechanical features of these steels, which he did, and remarkably well. He states that the picric acid used for etching the low chromium alloys had to be replaced with a special etchant of potassium bisulfate or hydrochloric acid for chromium contents above 9 pct. Later, in 1914, he writes on their remarkable corrosion resistance, particularly with regard to a chromium-nickel steel of a 14-4 analysis tested in nitric acid.[44]

Nevertheless, no credit is claimed for Guillet as a discoverer of the passivation phenomenon. That is reserved for Monnartz. Guillet discovered the "400-series" steels, producing them for the first time, and recording their metallurgical, metallographic, and mechanical characteristics for the first time.

In 1909, still 3 years or more before Brearley's first attentions to the alloys, and 6 years before his patenting, A. M. Portevin of France published a 35-page study[38] in England's own Carnegie Scholarship Memoirs which was devoted primarily to Guillet's alloys, but included others which Guillet does not seem to list. Table III lists all pertinent alloys discussed by Portevin. Seven steels fall within modern AISI limits, and three more nearly so. The most prominent modern alloys in both martensitic and ferritic classes are included. Portevin restricted his observations to mechanical and electrical properties in his 1909 paper, ". . . the micrographic study of these steels having already been published in detail."[38]

Nevertheless, he published in France in 1911[41] a special study of the effect of heat treatment on two steels having 13.04 Cr — 0.12 C and 17.38 Cr — 0.12 C - - - exactly the analyses of the popular types 410 and 430 today. This article, which demonstrated the sluggishness imposed by chromium on transformation structures, was translated and republished in 1912,[41] still a year or so before Brearley turned his attention to the alloys.

As with Guillet, Portevin made no issue of corrosion resistance, though he resorted to aqua regia as an etchant.

More to the point, these steels *are* the stainless steels, exactly those AISI 400-series alloys in principal use today; they originated in France in the period 1903-1908; and they were described in publications in leading metallurgical journals in France, England, and America years before the traditional "discoverers" ever gave them their attention. Whatever Brearley and other later investigators might have done in the way of discovering the special utilities of these steels, they did not discover the steels.

As a matter of fact, with this groundwork laid in France, and published in French, English, and American journals, one is not surprised to find a large number of men studying the alloys in 1911, 1912, and 1913. It is surprising, however, to observe violent and involved patent liti-

**TABLE III**

Portevin's "400-Series" Stainless Steels in 1909 and 1911

| Cr | C | Si | S | P | Mn | Corresponding AISI Type |
|---|---|---|---|---|---|---|
| 13.04* | 0.12 | ..... | ..... | ..... | ..... | 410 |
| 17.38* | 0.12 | ..... | ..... | ..... | ..... | 430 |
| ..... | ..... | ..... | Series I (9 alloys | < 11 P ct Cr) | | ..... |
| 13.60 | 0.142 | 0.210 | 0.015 | 0.016 | trace | 410 |
| 13.65* | 0.166 | 0.270 | trace | 0.015 | trace | ("410-C") |
| 14.52 | 0.382 | 0.469 | 0.11 | 0.013 | trace | 420 |
| 22.06 | 0.210 | 0.527 | trace | 0.011 | trace | 442 |
| 25.31 | 0.244 | 0.256 | 0.013 | 0.020 | 0.108 | 446 |
| 31.75 | 0.464 | 0.373 | 0.006 | 0.024 | ..... | ..... |
| ..... | ..... | ..... | Series II (7 alloys | < 12 Pct Cr) | | ..... |
| 14.54 | 0.741 | 0.486 | 0.038 | 0.008 | trace | (440-A) |
| 13.94* | 0.705 | 0.180 | trace | 0.010 | 0.240 | (440-A) |
| 18.65 | 0.905 | 0.745 | 0.007 | 0.010 | trace | 440-C |
| ..... | ..... | ..... | (3 alloys | > 26 P ct Cr) | | ..... |

* Not listed by Guillet.[39]

gation which largely ignores these true discoverers.

Haynes,[49] for example, reproduces notebook entries showing his interest in the alloys beginning Nov. 15, 1911. But the alloys had been defined metallurgically long before, as just proved. In 1912 Haynes noted the "nontarnishing" properties, but this feature had been mentioned by Berthier 90 years before, patented by Woods and Clark 40 years before, and the passivation phenomenon had been described in great detail by Monnartz for several years preceding, as will shortly be demonstrated. A patent application of Haynes was rejected because "Cr-Fe alloys are not new." This statement is certainly correct. Haynes filed again, and two weeks later Brearley filed a patent which was accepted because Brearley defined polishing and hardening as prerequisites for corrosion resistance.[47] The dwelling of Brearley's patent claims on "hardened and polished articles," particularly cutlery, fits his contribution particularly well, but one is puzzled that the patent did not encounter difficulty with such statements as: "I have discovered that the addition to iron of an amount of chromium anywhere between 9 pct and 16 pct and also an amount of carbon not greater than 0.7 pct will result . . . ."

On the other hand, Brearley goes on to say ". . . in a product which, when made into knife blades, has the said characteristics." This legitimately qualifies him as a discoverer of a new application, but it does not qualify him as an inventor of the steel. The situation seems analogous to one in which a man "discovers" that a material of thermoplastic composition makes a good mouth organ. This man is not the discoverer of the thermoplastic; it was already there. He discovered another use for it.

Brearley obtained Canadian patents in 1915 and 1919.[46] Of greater interest is the fact that he temporarily obtained patents in France,[48] the land of discovery, but none in his own England, for reasons the writer does not know. But we understand that the French patents were later disqualified.

As for Haynes and Brearley arguing over dates near 1912 as the nucleation point of stainless steel, the record can be used again to prove

**TABLE IV**

Guillet's Austenitic Chromium-Nickel Stainless Steels in 1906

| Cr | Ni | C | Si | S | P | Mn | Corr. AISI Type |
|---|---|---|---|---|---|---|---|
| | | | Series 1 | | | | |
| 18.20 | 5.40 | 0.268 | 0.175 | 0.006 | 0.006 | traces | (301) |
| 10.15 | 12.50 | 0.216 | 0.513 | 0.044 | 0.016 | 0.056 | ("12-12") |
| 20.55 | 10.60 | 0.315 | 0.613 | 0.013 | 0.010 | traces | (309) |
| 10.03 | 32.32 | 0.181 | 0.419 | 0.010 | 0.005 | 0.190 | ("35-15") |
| 20.44 | 29.44 | 0.305 | 0.885 | 0.010 | 0.005 | 0.252 | |
| ... | ... | ... | Series 2 (9 alloys, C > 0.70 Pct) | ... | ... | ... | ... |
| ... | ... | ... | Series 3 (5 alloys, Cr < 6 Pct) | ... | ... | ... | ... |
| ... | ... | ... | Series 4 (6 alloys, Cr < 6 Pct) | ... | ... | ... | ... |

C. Dantsizen, pioneer in the commercialization of stainless iron-chromium alloys for turbine blading (1911).

that neither of these men would have been the true discoverer of the steel even in the complete absence of the work of the great French pioneers just cited. Besides Portevin's publication in England,[38] the Carnegie Scholarship Memoirs carried another monumental article in that same year by W. Giesen[35] discussing steels with 8 to 18 pct Cr and 0.3 pct C, exactly Brearley's analyses. And in this country, the Court Records of the great patent suit of the American Stainless Steel Co. and the Electro Metallurgical Co. v. the Rustless Iron Corp. of America[52] contain proof that C. Dantsizen of the General Electric Research Laboratory began in September, 1911, developing low-carbon chromium alloys in the stainless range, introducing the steel in 1914 to steam-turbine blade service for which type 403 is still used today. As for chromium-iron alloys of very low carbon content, of course, these were also produced previous to 1907 by Treitschke and Tammann[31] in a complete constitutional survey of the system using Goldschmidt carbon-free chromium.

Again, back in Europe Monnartz began his investigations as early as 1908 on exactly these alloys, patenting a stainless composition in 1910,[39] and in 1911[40] writing at length on: "The Study of Iron-Chromium Alloys with Special Consideration of Their Resistance to Acids," devoting particular attention to passivity as the cause of their phenomenal corrosion resistance when the chromium content is sufficiently high and the carbon content sufficiently low!

Who discovered stainless steel?

Turning now to the other great branch of stainless alloys, the austenitic chromium-nickel steels (AISI 300 series) one finds an identical contradiction.

Strauss and Maurer discovered these alloys, popular tradition tells us.

By way of first correction, there is the pointed and outspoken clarification by Maurer,[55] corroborated by Schafer,[54] that Strauss had nothing to do with the origination of the work, but only in its prosecution in his position as an assistant to Maurer. This is rendered plausible by the fact that Maurer obtained his doctorate under Osmond in France and there had contact with stainless alloys as early as 1909. He apparently gained the concept from the French and carried it to Krupp for development. It is also consistent that German[42] and British[43] patents in 1912 and 1913 list Maurer as senior inventor. Strauss stepped into principal public attention with a paper in 1914 peculiarly under his single authorship,[45] and then with numerous later papers[50] and improvements in stainless steel practice which do earn him a position as a prominent investigator, but perhaps mislead the casual reader to grant him credit as a discoverer of this steel.

But if an argument is to develop over Maurer and Strauss, let it concern again only that restricted inventorship of further developments and applications; for the austenitic chromium-nickel steels, including several analyses virtually identical with those in standard use today, were made and studied by the same Leon Guillet[33] in France in the period 1904 to 1906 nearly 10 years before the date of discovery claimed by Maurer.[55] Also, in England, Giesen's[35] 59-page article in 1909 in Carnegie Scholarship Memoirs contains such a store of information on the austenitic steels that his investigation must date back it the latest to 1907. Pertinent analyses of Guillet's steels are given in table IV, and Giesen's in table V.

True, carbon tends to be high on the basis of present practice, and no type 304 analysis appears. On the other hand, the primary issue here concerns the basic discovery of austenitic chromium-nickel steel; and these alloys all fall in that category.

Now, returning to Strauss and Maurer's own work as late as 1920, one finds these men discussing their alloys on the basis of austenitic stainless steels with carbon contents generally higher than any of Guillet's and Giesen's listed in tables IV and V, and very few as low. In fact, their original patents on the austenitic alloys define carbon only as a maximum at 1.0 pct.[42, 43]

In this respect, one can quote P. A. E. Armstrong, whose opinion is authoritative: "When the 18 and 8 alloys were first produced, the carbons were in the order of about 0.20 to 0.30 pct, very few lower and quite a number higher. . . . An 18 and 8, according to Strauss, is an alloy well within the austenitic or nonmagnetic region."[53] The situation therefore plainly admits Guillet's and Giesen's alloys if it admits Maurer's and Strauss's.

In fact, the carbon content of Giesen's alloys is less than 0.20 pct in three steels; and the compositions of the first two alloys listed in table V fall within the AISI limits for types 301 and 310, respectively, except for a minor divergence in chromium content. Guillet's alloys are similar to Giesen's, covering a wide range of analyses and tending to be slightly higher in carbon content.

In both investigations a great span of compositions has been carefully studied to provide an acceptable preliminary basis for a metallurgical understanding of constitution, microstructure, effects of heat treatment and mechanical properties. Both authors recognize the stabilization of the gamma phase by the nickel, aided by the sluggishness in transformation imposed by the chromium; and Guillet goes so far as to construct a temporary constitution diagram and to discuss "Cr-Ni-C balance," a matter of marked attention today. In each investigation, several stable austenitic alloys are produced which are closely similar to the present popular 35-15 analysis, and they are so indicated in the tables.

These, then, are the austenitic chromium-nickel alloys in true basis; and the matter of a modern decreased carbon content is inadmissible as evidence against the true discovery, having instead the nature of an improvement, just as type 304 subsequently superseded type 302, now to be superseded in turn by the new "ELC" type 304.

E. Haynes, pioneer in the commercialization of stainless iron-chromium alloys.

TABLE V

Giesen's Austenitic Chromium-Nickel Stainless Steels in 1909

| Cr | Ni | C | Si | S | P | Mn | Corr. AISI Type |
|---|---|---|---|---|---|---|---|
| 19.12 | 6.30 | 0.167 | 0.444 | 0.007 | 0.008 | 0.012 | (301) |
| 19.71 | 20.34 | 0.220 | 0.219 | 0.010 | 0.010 | trace | (310) |
| 15.01 | 24.21 | 0.210 | 0.482 | 0.026 | 0.016 | 0.189 | |
| 15.18 | 25.32 | 0.216 | 0.873 | 0.013 | 0.018 | 0.176 | |
| 20.12 | 30.48 | 0.280 | 0.754 | 0.042 | 0.002 | 0.054 | ("35-15") |
| 19.76 | 32.68 | 0.181 | 0.635 | 0.056 | 0.005 | trace | |
| 29.38 | 30.79 | 0.142 | 0.521 | 0.010 | 0.010 | trace | |

R. Franks, prominent contributor to modern theory and practice.

### Discovery of Corrosion Resistance

In the face of this evidence that the fundamental compositions of the stainless steels were produced and widely explored metallurgically some years before the traditionally honored discoverers studied them, there is a tendency to reserve credit to the latter group for the discovery of the unusual corrosion resistance of the alloys.

However, this hypothesis similarly disintegrates, and in so doing reveals further honorable work which has escaped traditional acclaim.

It has already been mentioned that Berthier,[3] one of the first to alloy chromium with iron, over 100 years ago, commented on the markedly increased corrosion resistance both for the low chromium steel and for the ferrochromium; and his comments were followed by similar observations of Mallet,[5] Bunsen,[6] Deville,[7] Fremy,[8] Wohler,[9] Boussingault,[17] Woods and Clark,[13] and finally by Carnot and Goutal[29] who showed that an inherently high corrosion resistance of the alloys was being obscured by a consistently high carbon content. Nevertheless, the argument would be needlessly weakened if based upon the work of any of these investigators, with the possible exception of Woods and Clark.

However, in 1908 these oblique observations culminated when P. Monnartz began work with W. Borchers on low-carbon iron-chromium alloys, with specific attention paid to corrosion resistance and the relationships of chromium and carbon. A publication in 1909[37] concluded that chromium-rich steels are highly resistant to acids under certain conditions, but that the carbon content must be controlled. A German patent application in 1910 described an acid-resistant steel of stainless classification[39] and in 1911 Monnartz published a monumental paper specifically on the corrosion resistance of "carbon-free" chromium steels.[40]

Monnartz made melts weighing several pounds from carbon-free iron and aluminothermic chromium made by the Goldschmidt process. Twenty-one analyses were prepared, including the pertinent compositions listed in table VI. He tested the alloys in HCl, $H_2SO_4$, $HNO_3$, $HNO_3$-HCl mixed acid, tap water, sea water and atmosphere. Among the far-reaching observations to be found in his paper in 1911, the following in particular cut to the core of the present argument and prove his priority in discovering the stainlessness of stainless steel, along with many other phenomena "discovered" by others decades later:

(1) Passivity, as described by Faraday, is specifically named as the phenomenon conferring "nobleness" upon the chromium steels under proper conditions. To quote: "There can be no doubt that the acid resistance of the iron-chromium alloys, with the exception of the iron-chromium carbides, depends upon passivity."

(2) Carbon content is given primary recognition in his several writings as being critical to corrosion resistance, a low value being desired.

(3) Stabilization of the carbon can be effected by adding such carbide-formers as Ti, V, Mo, W, preferably in small amounts to avoid interference with other properties.

(4) Molybdenum and tungsten, among these, have the most beneficial effect on further improving corrosion resistance.

(5) Oxidizing or reducing conditions in the acid control the occurrence of passivity, the latter preventing it. To quote: "The passive state of Fe-Cr alloys depends upon the presence of sufficient oxygen, through oxidizing solutions, gaseous oxygen under pressure, or by anodic or galvanic connections."

(6) Prepassivation can be effected by first immersing the steel in nitric acid or by exposing it for a period in air, after which the resistance to sulfuric acid is marked. The passivation is maintained best in cold sulfuric acid, least in hot. Once "activated," the steel dissolves rapidly.

(7) Nitric acid provides an optimum demonstration of the passivation phenomenon, behaving as follows:

(A) 5 pct Cr improves the mechanical properties and increases the resistance to conc. nitric acid, losing passivity in dilutions greater than 1:1;

TABLE VI

Monnartz's Alloys in 1911

| Chromium Content, (Pct)* | Corresponding AISI Type |
|---|---|
| 11.2 | |
| 12.5 | 410 |
| 15.2 | 430 |
| 16.5 | 430 |
| 17.8 | 430 |
| 19.5 | 442 |
| 26.0 | 446 |
| 26.3 | 446 |

* Virtually pure Fe-Cr alloys.

(B) 9 pct Cr further increases the resistance, and to greater dilutions;

(C) 11 pct Cr will resist sp. gr 1.08 nitric acid;

(D) 12.5 pct Cr resists any concentration of nitric acid at room temperaturues;

(E) 14 pct Cr extends this resistance to hot acid;

(F) 20 pct Cr effects a resistance virtually equal to that of pure chromium, such that a greater alloy content is unnecessary. Furthermore, the 20 pct alloy can be worked and drawn;

(G) Salt added to nitric acid incepts attack;

(H) Electromotive force measurements confirm a noble potential for the passive alloys in nitric acid which is lost when sodium chloride is added, but is regained on standing in air;

(I) Rusting from atmosphere and tap water is completely resisted, a sample after 2 years in the laboratory showing its original "silver-clear lustre." In sea water, the high alloys showed good resistance, but the lower were attacked;

(J) Reflux condensers were used for the tests, with measurements made after consecutive periods much like the modern procedure; and it was similarly found that the greatest weight loss occurred in the initial period.

To emphasize further the invincibility of Monnartz's position as a discoverer on the basis of these striking observations, two of his figures are reproduced here, see fig. 1. In the first, a 1-hr test in boiling 5 pct $HNO_3$ discloses the adverse influence of the first several percent of chromium, followed by a sharp decrease in corrosion in a range near 10 pct. The subsequent decrease near 12 pct, however, is so precipitous, and the final value becomes so small, that Monnartz provides the second figure based on 100-hr tests to "magnify" the role of passivity.

The present author submits that these are as convincing and reliable illustrations of the passivity phenomenon in stainless steel as any published in the intervening four decades.

Who discovered stainless steel?

On the basis of these records, one is forced to revise the traditional credits to those shown in table VII. Prominent roles in the early development of these steels must be granted, of course, to such men as Strauss, Haynes, Dantsizen, Becket, Armstrong, Johnson, Payson, and others; but the discoveries made by these men seem necessarily secondary even though in some cases the work might have been truly performed without foreknowledge of the investigations here cited.

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P. A. E. Armstrong, pioneer in the development of complex stainless alloys ("Silcrome").

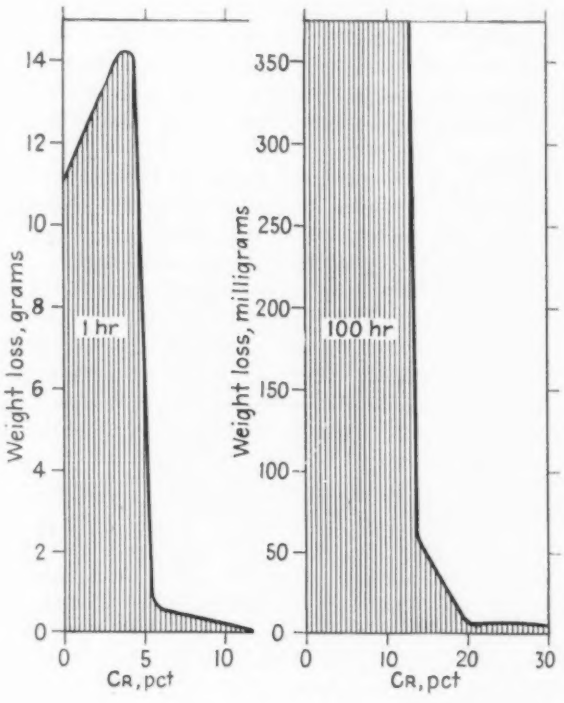


FIG. 1—Figs. 287 and 288 (redrawn) from Monnartz[10] for low carbon chromium iron alloys in boiling 5 pct $HNO_3$, illustrating the passivation phenomenon.

E. C. Bain, prominent contributor to modern theory and practice.

C. M. Johnson, pioneer in the development of complex stainless alloys ("Rezistals").


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## TABLE VII

### Discoverers of Stainless Steel

| Investigator | Discovery |
|---|---|
| Guillet, L.<br>Portevin, A. M.<br>Giesen, W. | Compositions and primary metallurgical characteristics of the stainless steels—martensitic, ferritic, and austenitic |
| Monnartz, P. | Stainlessness and the passivation phenomenon (also commercial utility of the chromium grades) |
| Brearley, H. | Commercial utility of the chromium grades |
| Maurer, E. | Commercial utility of the chromium-nickel grades |

# Color METALLOGRAPHY

By W. D. Forgeng

*Union Carbide and Carbon Research Laboratories, Inc., Niagara Falls, N. Y.*

***The use of color in metallography is particularly advantageous (1) in alloys containing carbides, inclusions or sigma phase constituents, and (2) in grain size determinations not otherwise apparent by usual metallographic methods. These advantages are illustrated in this article, in which the author, employing nine different alloys, presents direct comparisons between black and white reproductions and color prints of identical structures. A description of the etching and photographic techniques required for optimum results is also included.***

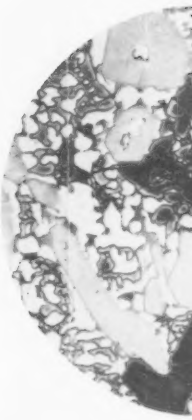
COLOR photomicrography has been found to be a valuable aid in the study of metallic structures. With the introduction, in recent years, of color film and print material that are not only capable of excellent color rendition but can be readily processed in the usual photographic laboratory, the use of color has been made much more attractive for the metallographer. It is now possible to obtain a finished photomicrograph of a metal specimen in color in a matter of hours rather than weeks as was formerly the case when the film had to be sent to the manufacturer for processing. To anyone who has viewed brilliantly-colored specimens through the microscope, the advantages of color prints over black and white reproductions are obvious. In the following sections an effort will be made to point out these advantages by practical examples.

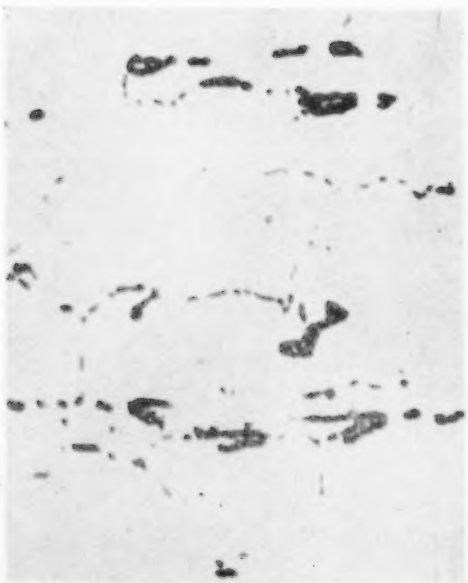
Metallography in color is somewhat more difficult than ordinary metallography because the quality of the illumination, the apertures and exposure time, have to be under rigid control for consistent results. The standard metallograph with mechanically-fed carbon arc illumination satisfies these requirements. Apochromatic objectives are to be preferred over achromatic objectives and a vertical illuminator of the transparent reflector type rather than the prism type must be employed. In order to obtain optimum contrast with a minimum sacrifice of resolution, the aperture diaphragm should be set so that about two-thirds of the objective is illuminated as indicated by viewing the back lens of the objective through the body tube with the eyepiece removed. If a field diaphragm is part of the equipment, it should be closed down to the size of field required in order to minimize glare.

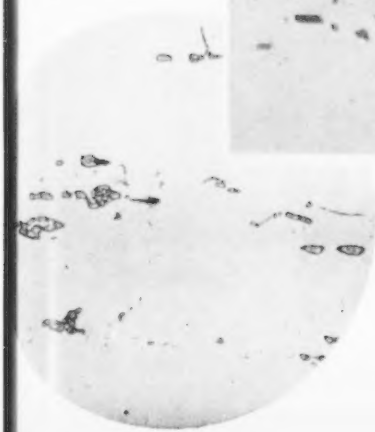
Either Ansco Color Film or Eastman Ektachrome will furnish satisfactory transparencies. They are available in either the daylight type or the tungsten type. When using the carbon arc as the illuminating source, the daylight type ordinarily requires no compensating filters. If desired, however, certain colors may be intensified or subdued by the use of combinations of filters selected from the Ansco color compensating

# COLOR METALLOGRAPHY

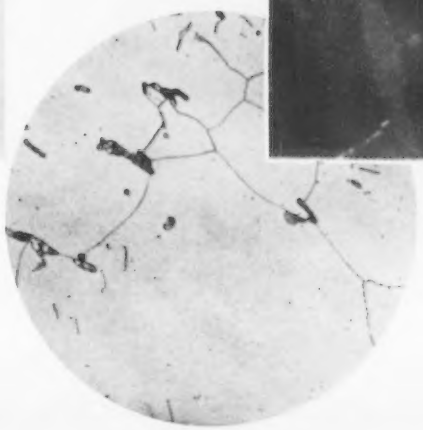
**As an illustration of the advantages of color in metallographic studies, there is presented herewith a series of black and white reproductions and color photomicrographs covering nine alloys prepared by W. D. Forgeng, Union Carbide and Carbon Research Laboratories, Inc., Niagara Falls, N. Y. The text accompanying this color insert describes etching and photographic techniques employed in obtaining the results shown on this page and also identifies the constituents present in the various alloys.**



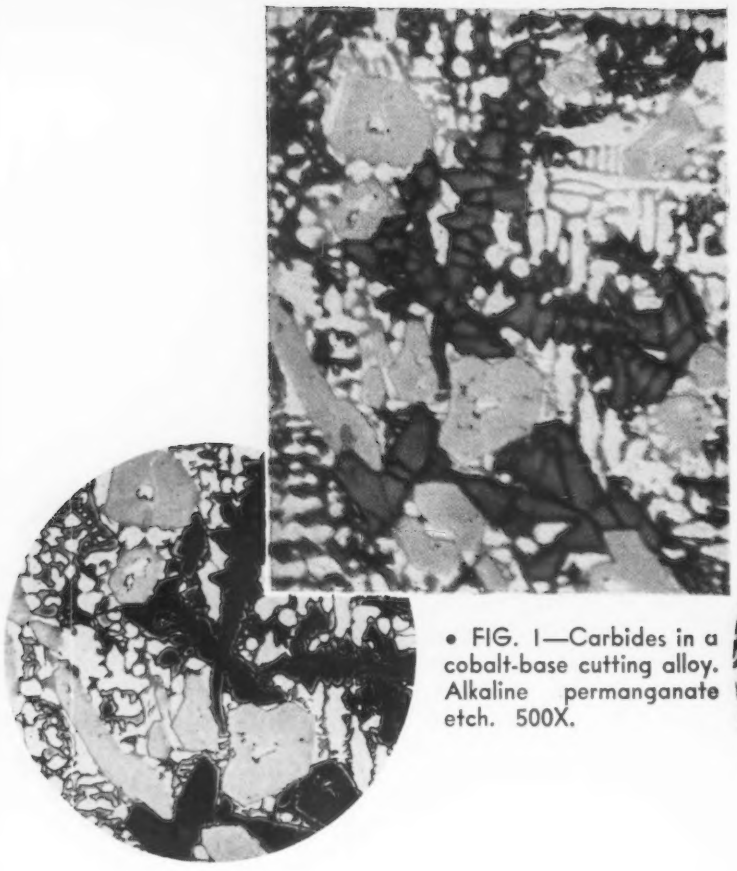




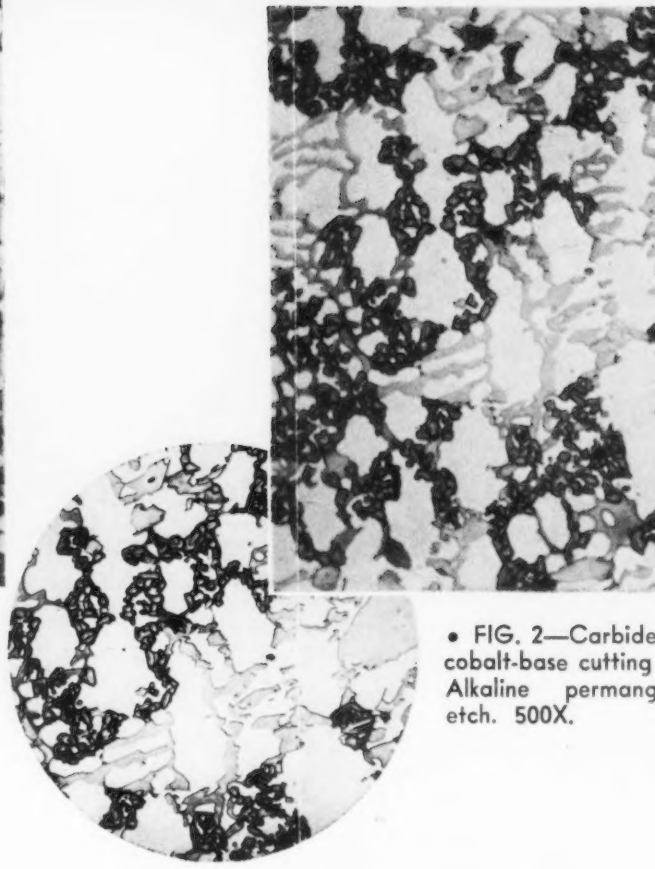
• FIG. 5—Sigma phase in an 18 pct Cr-8 pct Ni steel containing 3 pct Mo. Heated for 18 hr at 1600°F, etched with modified Murakami's reagent. 500X.



• FIG. 6—18 pct Cr-8 pct Ni steel boiled in nitric acid for 8 hr. Ordinary illumination and crossed nicols. 500X.

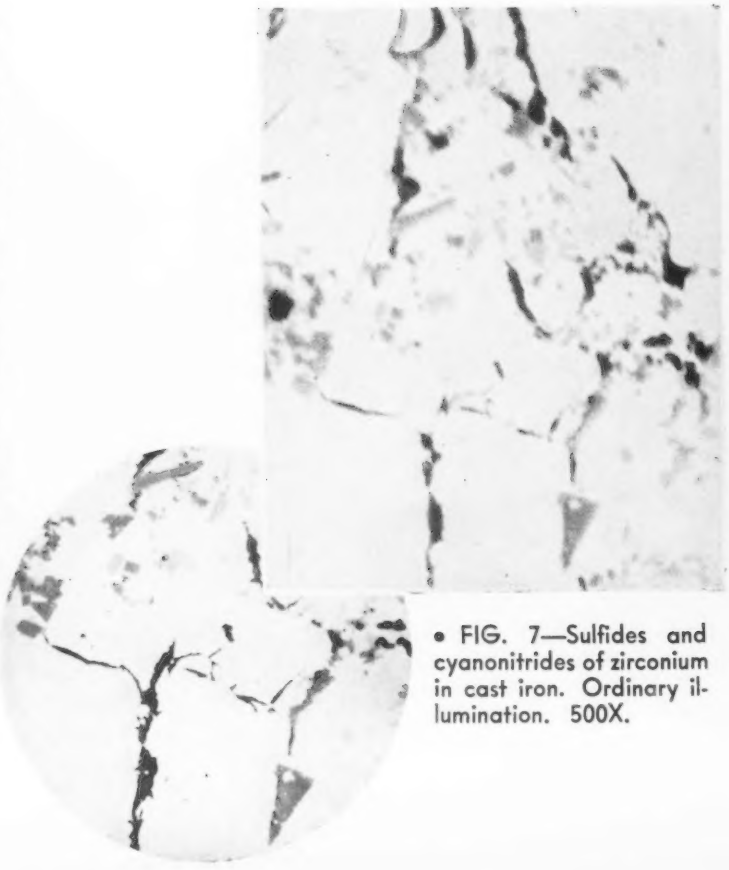


• FIG. 1—Carbides in a cobalt-base cutting alloy. Alkaline permanganate etch. 500X.

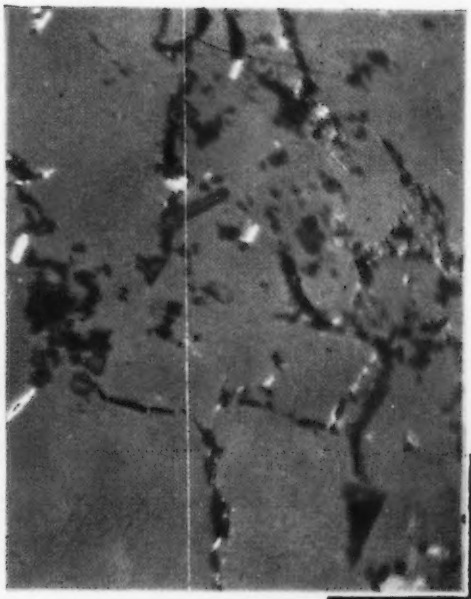


• FIG. 2—Carbide cobalt-base cutting Alkaline permang etch. 500X.

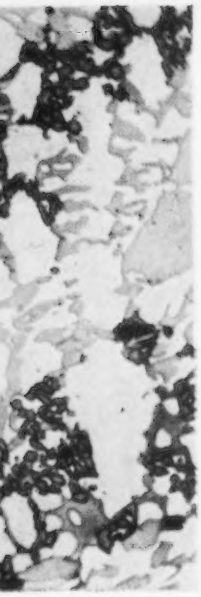
t Cr-8
d in ni-
Ordi-
n and
IX.



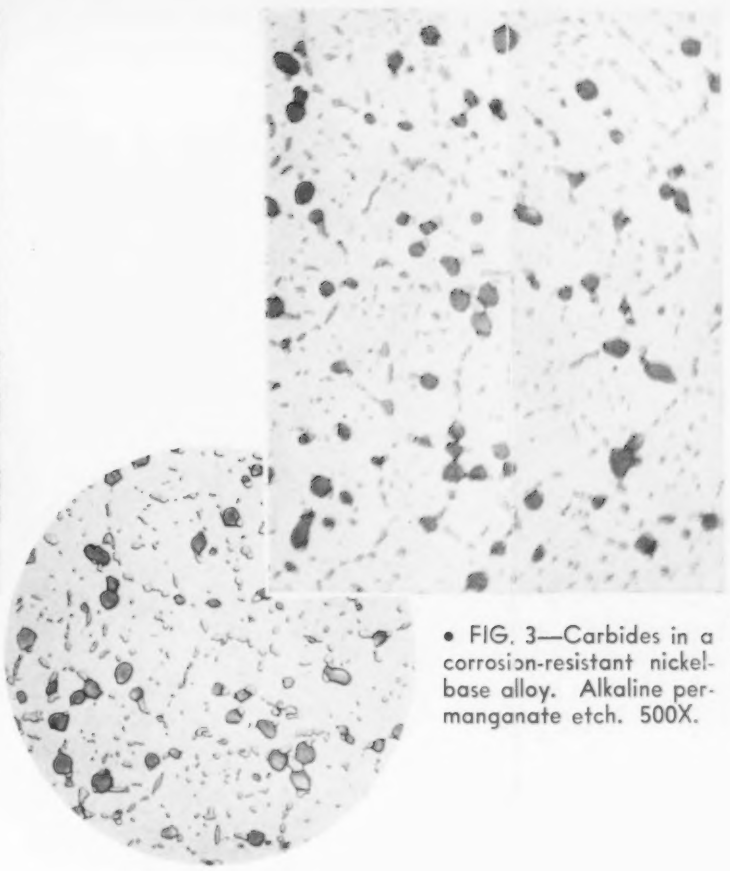
• FIG. 7—Sulfides and cyanonitrides of zirconium in cast iron. Ordinary illumination. 500X.



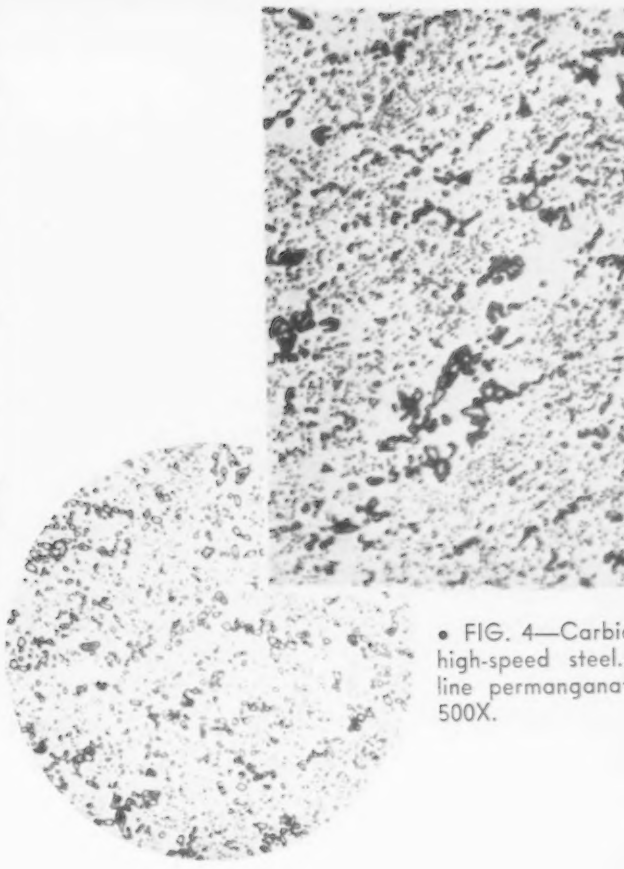
• FIG. 8—Same area as fig. 7 with crossed nicols and "sensitive tint."



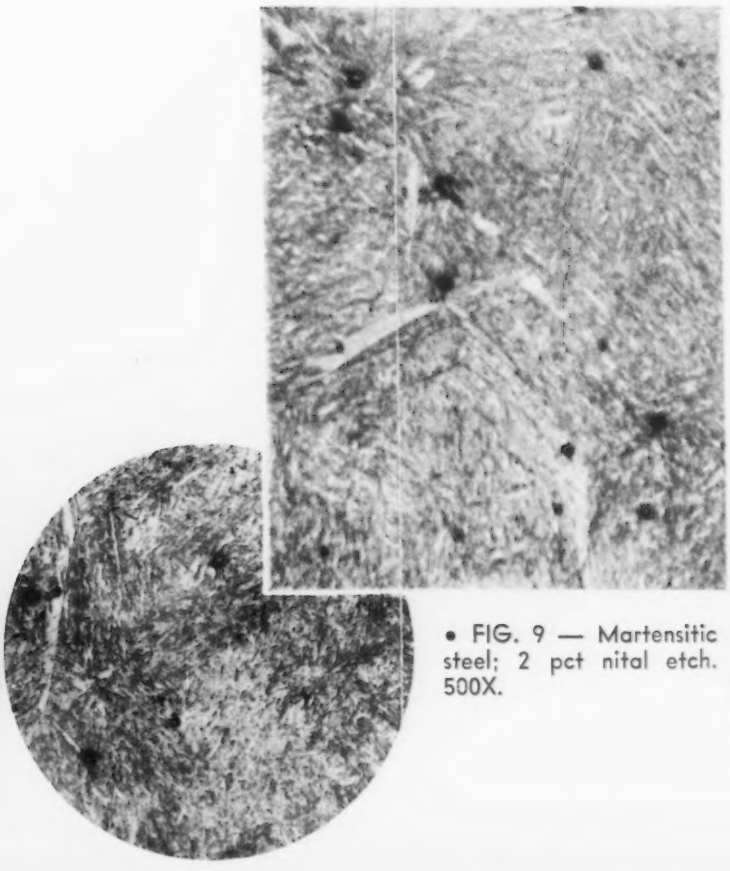
2—Carbides in a
ase cutting alloy.
permanganate
00X.



• FIG. 3—Carbides in a corrosion-resistant nickel-base alloy. Alkaline permanganate etch. 500X.

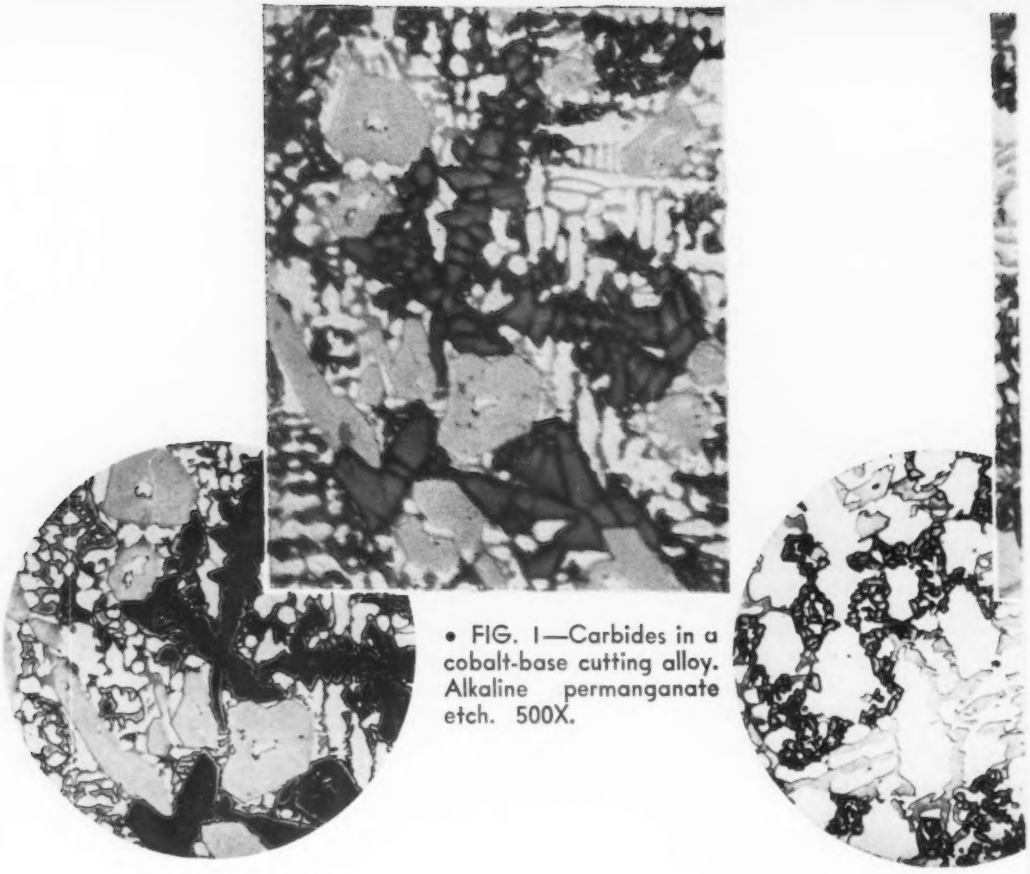


• FIG. 4—Carbi
high-speed steel.
line permanganat
500X.



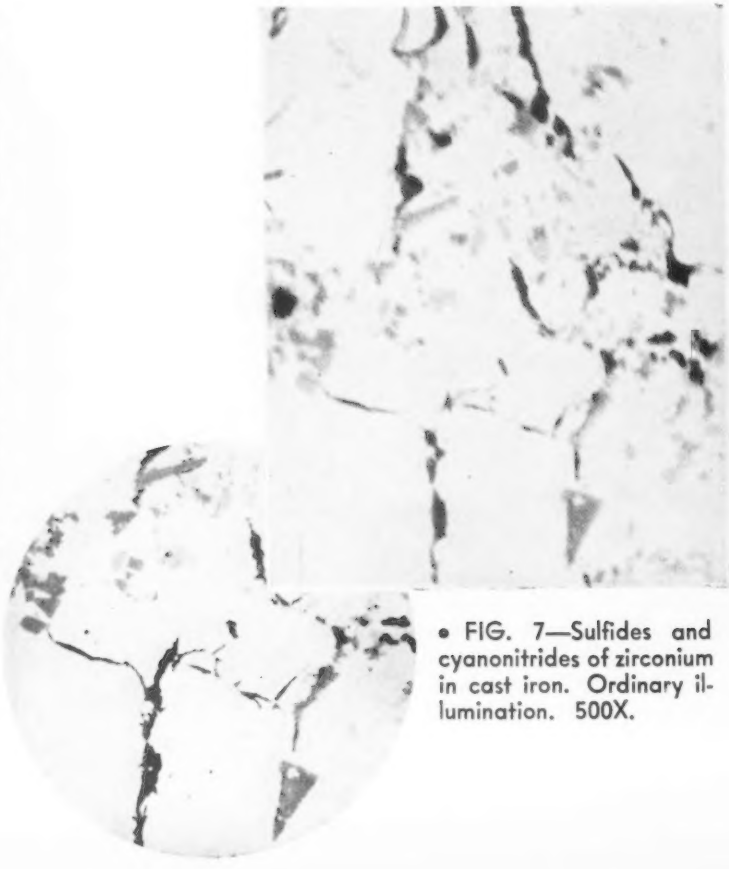
• FIG. 9 — Martensitic steel; 2 pct nital etch. 500X.

• FIG
sulfide
tride
2 pct

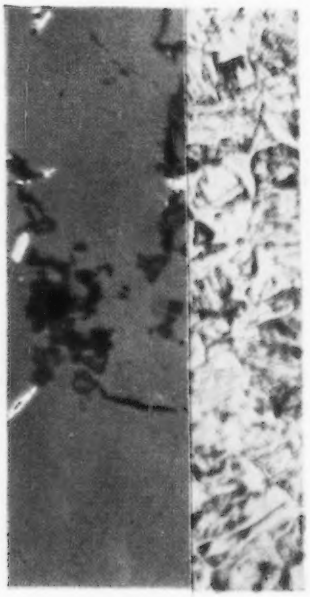


• FIG. 1—Carbides in a cobalt-base cutting alloy. Alkaline permanganate etch. 500X.

t Cr-8
d in ni-
Ordi-
n and
)X.



• FIG. 7—Sulfides and cyanonitrides of zirconium in cast iron. Ordinary illumination. 500X.



• FIG. 8—Same fig. 7 with cross- and "sensitive

nganese
nium ni-
tin steel;
500X.

filters, yellows 23, 24 and 25, magentas 33, 34 and 35, and cyans 43, 44 and 45. When using the tungsten-type film with the carbon arc, it is necessary to remove the ultraviolet component of the arc by means of a Wratten 2A, Ansco Color UV16, or a Corning Noviol No. 3060 filter, and to balance the colors by means of suitable combinations of the color compensating filters.

### Determining Exposure Time

The correct exposure time can be determined in a number of ways.[1] The use of a graduated test strip is one of the simplest and most reliable methods. In order to prepare the test strip, a narrow strip is cut from the edge of the color film (in total darkness) and fastened in the plate holder. Exposures of ½, 1, 2, 4 and 8 sec are made consecutively by drawing out the slide of the plate holder fully for the first ½ sec exposure and returning it in ½-in. steps for each succeeding exposure until the final step has had a total exposure time of 8 sec. These times will cover most bright field subjects, but for dark field or polarized light with crossed Nicol prisms, much longer exposure times are required and a typical test strip should be exposed for 30 sec, 1 min, 2 min, 4 min and 8 min.

When the film has been exposed, it can be processed immediately with chemicals obtainable from the manufacturers of the film. The directions furnished are easily followed by anyone familiar with usual dark room procedures, but the times and temperatures recommended for the various steps must be carefully regulated for optimum results. Complete processing requires less than 2 hr and a number of films can be carried through at one time. Color prints can be made from the transparencies by contact printing or enlarging directly onto Agfa Color Reversible Printon. This is a white, opaque film base material on which are coated the color-sensitive emulsions and filters forming a tripack unit similar to the color film. The directions for exposure and development of Printon are supplied with the necessary processing materials by the manufacturer.

If transparencies are not required, prints can be made directly with the metallograph by substituting Printon for the color film in the plate holder. Excellent rendition of color can be obtained by the proper choice of filters. A test strip is made in a manner similar to that described previously for transparencies. The test strip is processed in the ordinary manner and evaluated for color balance as well as exposure time. If the color balance is not satisfactory, it can be changed subsequently by using different combinations of the color-compensating filters in the optical system of the microscope.

The filters can be selected by viewing the test strip through different combinations of filters until the colors in the test strip most nearly match the original colors of the object. The filter or filters should be held some distance from the test strip so that the light striking the test strip does not first pass through the filter as would be the case if the filter were laid directly on the test strip. When the proper exposure time and filters have been determined, the required number of prints can be made without changing the selected field. If it is desirable at a later time to have additional prints, these can be made rather simply by photographing one of the prints in color at natural size under the proper illuminating conditions.

In the visual examination and comparison of several metallic samples that show color differences, these differences are lost to the memory and in such cases the use of color photomicrographs is of great assistance in recording an accurate, permanent representation of each specimen being studied. Interestingly enough, many details that are missed in visual examination can be subsequently discovered in a leisurely examination of a color print or transparency. It is hoped that the following illustrations will serve to demonstrate some instances in which color photomicrography can be applied with considerable benefit to the metallographer.

### Carbides in Tool and Abrasion-Resistant Alloys

The properties of most cutting tools and abrasion-resistant alloys depend to a great extent upon the form in which the various carbides of the transition element are present. The identification and recognition of the carbides is quite necessary to an understanding of these alloys. Many etching procedures, particularly those that result in differential color staining have been developed for this purpose.[2]

A method that has been found applicable to a number of different alloy types is an alkaline-permanganate solution, modified somewhat from the original reagent, recommended by Groesbeck.[3] The present procedure requires a well-polished surface and preliminary activation of the surface with a very short (about 1 sec) electrolytic etch in 1 pct chromic acid. It is then immersed for 5 to 10 sec in the alkaline-permanganate solution, which is prepared by mixing (immediately before use) equal parts of a saturated solution of potassium permanganate and an 8 pct solution of sodium hydroxide. After etching, the specimen should be washed in running water and in alcohol and dried in an air blast, since any rubbing will remove the deposit left by the etching solution.

Fig. 1 shows the results obtained when a cobalt-base cutting alloy containing chromium, tungsten and carbon is etched with this reagent. In the ordinary photomicrograph the carbides are stained in various shades of gray to black, while the matrix of cobalt-rich solid solution is left white. The black and white photo gives no

*The editors acknowledge the valuable cooperation of the ASTM in the development of the material presented in this article. A very comprehensive discussion of color metallography will be contained in a symposium on color metallography, based on papers presented at the recent ASTM annual meeting in Detroit, to be published shortly by the society.*

hint of the rich gradations of color exhibited by the specimen as is shown in the color photomicrograph. Here it will be seen that three different carbides can be distinguished from each other by their colors. These carbides are of the general types $M_7C_3$, $M_4C$, and $M_6C$. The $M_7C_3$ type, which is essentially the hexagonal carbide $Cr_7C_3$ with part of the chromium replaced by cobalt and tungsten, is stained a light tan by the reagent. The $M_4C$ type, which has been identified as the cubic chromium carbide $Cr_4C$, or more accurately $Cr_{23}C_6$, with cobalt and tungsten atoms substituting for some of the chromium, is colored a dark brown or light blue and appears as a darker edge on the tan $M_7C_3$ and as one of the constituents of the eutectic.

The color of the carbide $M_6C$ is not constant and will usually vary sometimes within a single crystal from red to green with occasional brilliant shades of yellow or blue. It is easily distinguished from other carbides by its variable and richer colors. This carbide is also cubic and is a true double carbide since it does not occur in any binary system and requires for its formation the presence of one or more of the elements iron, nickel, cobalt, or chromium, as well as either tungsten or molybdenum. Its usual composition limits in the cobalt-base alloys are between $(Co, Cr)_4W_2C$ and $(Co, Cr)_3W_3C$.

### Effect of Film Thickness

The color developed by the alkaline permanganate is due to interference between light waves reflected from the two surfaces of a thin film deposited on the specimen. The hue depends upon the thickness of the film, and unless the etching times are kept fairly constant, each carbide will go through a range of colors.

An alloy of similar type, but lower tungsten content, is shown in fig. 2. The primary $M_6C$ carbide has disappeared and is present only as a constituent of the eutectic. Although it is not indicated in the black and white photomicrograph, the eutectic contains all three carbides, the tan $M_7C_3$, the blue $M_4C$, and the varicolored $M_6C$.

Fig. 3 shows precipitated carbides in a corrosion resistant low-carbon, nickel-base alloy containing chromium and molybdenum. The specimen was etched with the alkaline-permanganate reagent, and it may be distinctly seen from the colors that two different carbides are present. The red particles have been identified by X-ray diffraction methods and chemical analyses as $M_6C$ having the approximate formula $(Ni, Cr)_4Mo_2C$, while the blue particles have the structure of $Cr_4C$ with part of the chromium replaced by nickel and molybdenum. The white matrix is the nickel-rich solid solution.

The alkaline permanganate reagent in conjunction with color photomicrography is also applicable to the study of the carbides in high-speed steels of the 18-4-1 type, fig. 4. The varicolored particles in this quenched and tempered specimen are the $M_6C$ type carbide with the approximate formula $(Fe, Cr, V)_3W_3C$. Under these etching conditions, neither the carbide $Fe_3C$ nor the martensitic background is stained.

Recognition of the sigma phase in iron-chromium and iron-chromium-nickel alloys is a matter of considerable importance to the user of these alloys. The presence of this phase, which develops in some alloys on prolonged holding in the temperature range of about 1110° to 1650°F has a deleterious effect on ductility and impact strength. It has been reported[4] that a modification of Murakami's reagent permits a distinction between ferrite and sigma, the two constituents being revealed in contrasting colors. More recently[5] this reagent has been employed for identification of the sigma phase in an austenitic steel of the 25 Cr-20 Ni type. The modified reagent is prepared by mixing 30 g of potassium ferricyanide, 30 g of potassium hydroxide and 60 ml of water. The reagent should be freshly prepared, brought to a boil, and allowed to cool before use in order to obtain consistent results. The colors developed by immersion of the specimen in this solution depend upon the etching time; the sigma phase is rapidly stained, ferrite less rapidly and austenite is not affected.

Fig. 5 shows pools of sigma in austenite in an 18 Cr-8 Ni steel containing 3 pct Mo. The steel was heated for 18 hr at 1600°F in order to form the sigma phase and was etched for 4 sec. As may be seen, the sigma phase is colored green and red while the austenite is left uncolored. This method for the recognition of sigma is limited to magnifications where a dry objective can be used. The colors are due to the presence of a thin film and fade out when the system is made optically homogeneous as is the case when an oil immersion objective is employed. Consequently, the recognition of very small particles of sigma with this reagent is very difficult.

### Color Metallography with Polarized Light

Reflected polarized light has found extensive application in recent years in the study of metals and alloys[6, 7, 8, 9]. Some of the phenomena exhibited by polished surfaces in polarized light can be adequately described or recorded in black and white, but the color effects produced by this type of illumination are described with difficulty and a proper description depends to a very great extent on the judgment and memory of the individual making the observations. Recording of polarization effects in color has proved to be of inestimable aid in such studies.

When an unetched specimen of an isotropic, cubic metal such as iron, aluminum, or copper is examined between crossed Nicol prisms, it appears black. Transparent or translucent inclusions in the metal appear bright and show their characteristic transmission color. This is due to alteration of the original plane of vibration of the incident polarized light by reflection from the metal surface behind the inclusions. The colors resulting from this "dark-field effect" are dependent upon the chemical constitution of the inclusion material and are useful criteria in identifying the inclusions.

If the metal specimen is etched, some unusual effects are sometimes produced by crossed Nicols.

Fig. 6 illustrates this. Fig. 6 is a photomicrograph of an 18 Cr-8 Ni steel that was polished and placed in boiling nitric acid for 8 hr. It may be seen that the grain boundaries are delineated, but little structure is visible within the grains in the black and white reproduction. The color photomicrograph, which is the same area between crossed Nicols, shows that the nitric acid treatment has brought out the twinned structure of the grains. This method of illumination has been found useful in revealing the actual grain size of some alloys where etching procedures were not entirely successful for that purpose, and it often reveals a sub-grain size that would not otherwise be apparent.

Polarization effects can also be produced by certain opaque or very nearly opaque inclusions that do not crystallize in the cubic system. The polarization colors shown by such inclusions between crossed Nicols are usually of a very low order and appear as various shades of gray. By using a quarter-wave plate in conjunction with a first order red plate between the polarizer and the objective, the background color can be varied so as to obtain a so-called sensitive tint. At that point, any additional polarizing effects of the inclusions are added to or subtracted from the background color, and brilliant, contrasting colors may be obtained. This is illustrated by figs. 7 and 8.

Fig. 7 is a group of sulfides and cyanonitrides of zirconium in a cast iron. In black and white, some of the inclusions merely appear to be darker than others; further criteria for their identification are furnished by the color photomicrograph. It may be seen in this figure that the cyanonitrides vary in color from a blue gray to pink, depending upon their nitrogen contents. The sulfides appear tan. Between crossed Nicols, fig. 8, the cyanonitrides are black and those sulfide crystals that are in the proper orientation appear bright. A much better indication of the polarization effects is given in the color photomicrograph, and it may be seen that the anisotropic zirconium sulfide inclusions appear as bright yellow or blue, depending upon their orientation. By obtaining a permanent record of the colors shown by a particular inclusion and the background under these conditions, it is possible to secure a semiquantitative measure of the anisotropy of the inclusion which will be useful in its future identification.

Photomicrography in color reveals, in an unusual manner, some subjects that are generally considered colorless. Fig. 9 is a slightly tempered martensitic steel and in black and white is dull and uninteresting in appearance in comparison with the same subject in color. In the latter, some interesting structural details are brought into greater prominence by color. Another example is fig. 10, which shows inclusions of manganese sulfide and zirconium nitride in an etched specimen of steel. The zirconium nitride is difficult to see in the black and white photomicrograph, but with its bright yellow color, it is readily visible in the color photo.

In the investigation of certain metallurgical problems, color photomicrography can be of great assistance. It has the disadvantage of being more time-consuming and expensive than ordinary photomicrography. The advantages to be gained, however, in those cases where color differences exist or can be brought out in a metal specimen, make it well worth the added time and expense to secure a permanent record of these differences in color.

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[6] Dayton, Trans. AIME, 117, p. 119, 1935.
[7] Hoyt and Scheil, Trans. AIME, 116, p. 405, 1935.
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# Mechano-Electrical Transducer

A HIGHLY sensitive, variable resistance, spring type transducer, being developed at the National Bureau of Standards, is expected to provide a dependable method for converting mechanical displacement into a measurable change in electrical quantity. Used in this way, the device will be applicable to strain gages, pressure elements, accelerometers, electric weighing devices, automatic temperature controls, dc to ac inverters and voltage regulators.

Active element of the transducer is a helical or conical spring wound with a varying tension so that when the ends of the spring are pulled apart, the turns separate individually rather than simultaneously. In the closed position, the spring has an electrical resistance approximately that of a cylindrical tube. When stretched completely open, the resistance is that of the total length of the coiled wire. Resistances, therefore, will vary over a wide range and displacements as small as 0.000001 in. can be easily measured without resorting to electrical amplifying systems.

To decrease contact resistance between successive turns of the spring, a high average initial tension is used and the turns are coated with 0.0001 in. of gold. Nickel alloy wire is used for the base coil because of its high resistivity and small change of mechanical properties with temperature.

The transducers are usually constructed in the form of a 4-arm bridge in which each arm is a variable resistance spring. Any increase in applied tension then elongates one pair of springs and shortens the other pair. Resistive unbalance of the bridge, measured with a galvanometer, indicates the displacement which has occurred.

● ASM President—F. B. Foley, superintendent of research, Midvale Co., Philadelphia.

# National Metal Congress

PAYING tribute to the 75th anniversary of the alloy steel industry, the 30th National Metal Congress and Exposition, which is to be held in Philadelphia, October 25 through 29, will be dedicated to the theme "A Tribute to Alloy Steel."

The National Metal Congress, which will again combine technical sessions of four participating societies—the American Society for Metals, the American Welding Society, the American Institute of Mining and Metallurgical Engineers (Institute of Metals Div. only) and the Society for Non-Destructive Testing—will be conducted at the hotel headquarters of the societies. Headquarters for the ASM and the Society for Non-Destructive Testing will be at the Benjamin Franklin Hotel, for the AWS at the Bellevue-Stratford, and for the AIME at the Adelphia Hotel.

The equipment exposition itself will be housed in Convention Hall and will contain some 350 exhibits.

The traditional Industrial Gas breakfast, sponsored by the Industrial and Commercial Gas Section of the American Gas Assn., will be held Wednesday morning, October 27, at the Ritz-Carlton Hotel. Guest speaker at the breakfast will be Oliver Johnson, manager, market research, THE IRON AGE.

College alumni luncheons have been scheduled for Wednesday, October 27, by some of the leading technical schools and colleges of the country. All of the luncheons will be held at the Benjamin Franklin Hotel.

The American Society for Metals has scheduled some 45 technical papers supplemented with three educational lecture series—properties of metals in materials engineering, grain growth in industrial metallurgy, and metallurgy and magnetism. The technical program embraces a variety of subject matter, including heat treatment, steel ingots, nonferrous alloys, stainless steels, mechanical and engineering properties, high temperature alloys and testing.

Highlighting the technical program will be the Edward deMille Campbell Memorial lecture to be delivered Wednesday morning, October 27, at the Benjamin Franklin Hotel, by Morris Cohen, professor of physical metallurgy, MIT.

The annual banquet, which will be held Thursday evening, October 28, at the Benjamin Franklin Hotel, will feature the presentation of various honors and awards, including the awarding of the ASM gold medal to F. C. Frary, director of research, Aluminum Co. of America, and the presentation of the ASM medal for advancement of research to Willard Dow, president, Dow Chemical Co. The Henry Marion Howe medal will be presented to J. W. Spretnak, Metals Research Lab., Carnegie Institute of Technology. No award of the Sauveur achievement medal will be made this year. Retiring ASM president F. B. Foley, superintendent of research, Midvale Co., will preside at the banquet.

A unanimous ballot for the election of ASM national officers will be cast for H. K. Work, manager of research and development, Jones & Laughlin Steel Corp., as incoming president; A. E. Focke, chief metallurgist, Diamond Chain Co., Inc., as vice-president; and W. H. Eisenman

***30th annual meeting to pay tribute to 75th anniversary of alloy steel industry. Sessions to feature 200 technical papers —exposition to be highlighted by 350 exhibits of metal working equipment and supplies.***

# to Salute Alloy Steels

as secretary. Two new trustees are F. J. Robbins, vice-president and metallurgical engineer, Plomb Tool Co., and president of Sierra Drawn Steel Corp.; and H. P. Croft, director of technical control and research, midwestern district, Chase Brass and Copper Co.

The American Welding Society has scheduled approximately 70 technical sessions on such major subjects as shipbuilding, railroad equipment, nonferrous alloys, brazing, cutting, resistance welding, inert gas welding, arcs and electrodes, automatic welding, maintenance by welding, weldability of metals, and hardfacing.

In addition to these sessions, the AWS is conducting an educational lecture series, Monday, Tuesday and Wednesday from 4:30 to 6.00 p.m. at the Convention Hall. The subject of this lecture series is "The Metallurgy of Arc Welds in Steel," and the lecturer will be R. D. Stout of Lehigh University.

The Adams' Lecture, an annual highlight of the AWS meeting, will be given by G. E. Claussen of Reid-Avery Co., Inc., Baltimore, on Monday evening at 8:00 p.m, at which time the society will present medals and prizes for outstanding developments in its field. The annual dinner will be held at the Bellevue-Stratford on Thursday evening, October 28, at 7:00 p.m. The dinner speaker, G. Edward Pendray, will talk on rockets and jet propulsion.

At the business session and board of directors meeting on Friday afternoon, new officers for the association will be elected for the coming year. Since no other nominations have been submitted, the following officers will be elected to serve for

● AWS President—H. O. Hill, assistant chief engineer, Bethlehem Steel Co., Bethlehem.

● Chairman, Institute of Metals Div., AIME—A. A. Smith, Jr,, superintendent of research, American Smelting & Refining Co., Barber, N. J.

● President, Society for Non - Destructive Testing—Don McCutcheon, Ford Motor Co., Detroit.

the coming year: President, G. N. Sieger, president and general manager of S.M.S. Corp., Detroit; first vice-president, O. B. J. Fraser, assistant manager, development and research division, the International Nickel Co., New York; and second vice-president, H. W. Pierce, assistant to general manager, New York Shipbuilding Corp., Camden, N. J.

Directors at large to be elected include: J. J. Chyle, director of welding research, A. O. Smith Corp., Milwaukee; J. H. Humberstone, director of research and welding engineering, Arcrods Corp., Sparrows Point, Md.; T. B. Jefferson, editor, the Welding Engineer Publishing Co., Chicago; and H. N. Simms, metallurgist, Black, Sivalls and Bryson, Inc., Oklahoma City.

Technical sessions of the fall meeting of the Institute of Metals Div. of the American Institute of Mining and Metallurgical Engineers have been scheduled for three days, Monday through Wednesday, October 25, 26 and 27.

A symposium on rolling and drawing practice for rod and wire, the third in a series stressing practical information, will be the feature of this fall meeting. This symposium, for the first time, is being held during a fall meeting to permit a larger attendance of the practical metallurgists for whom the sessions are primarily intended. Papers on ferrous metallurgy will also be given for the first time under Institute of Metals Div. auspices, as ferrous physical metallurgy is now assigned to that group. The Iron and Steel Div., now devoted solely to production, will not have a technical program this fall.

Technical sessions have been organized to cover subjects such as properties of metals and alloys, plastic deformation, rod and wire practice, microscopy and grain growth, constitution and precipitation, diffusion and surface phenomena, and transformation.

The annual dinner will be held Tuesday evening, October 26, in the Crystal Room of the Adelphia Hotel. A. A. Smith, Jr., superintendent of research, American Smelting & Refining Co., Barber, N. J., chairman of the Institute of Metals Div., will be toastmaster. Dr. Waldo E. Fisher, professor of industry at the Wharton School, University of Pennsylvania, will be the featured speaker, his topic, being "The Taft-Hartley Act; An Appraisal."

Technical sessions of the Society for Non-Destructive Testing have been scheduled for both morning and afternoon, Wednesday, October 27, and for Thursday morning, October 28. The eighth annual business meeting will be held Thursday afternoon, October 28. All sessions will be at the Benjamin Franklin Hotel.

The papers will discuss radiographic inspection, X-ray diffraction for testing magnetic materials, industrial applications of soft radiation, experimental usage of radioisotopes, new testing methods for ceramics and other subjects.

Dr. F. A. Firestone will deliver the 1948 Mehl Lecture at the Thursday afternoon session. His topic will be "The Supersonic Reflectoscope, An Instrument for Non-Destructive Testing and Measuring by Means of Sound Waves."

# Correlated Technical Program of National Metal Congress

The four participating societies have organized their technical programs in the following manner: (1) The ASM will hold its morning sessions at the Benjamin Franklin Hotel and its afternoon sessions at Convention Hall on Monday, Tuesday and Wednesday, while the Thursday and Friday technical presentations will be held at Convention Hall; (2) the AWS will hold its technical program at the Bellevue-Stratford Hotel; (3) the AIME will meet at the Hotel Adelphia; and (4) the Non-Destructive Testing group will hold its sessions at the Benjamin Franklin Hotel.

The annual banquets will be held as follows: ASM—Thursday, 7:00 p.m., Benjamin Franklin Hotel; AWS—Thursday, 7:00 p.m., Bellevue-Stratford Hotel; AIME—Tuesday, 7:00 p.m., Hotel Adelphia.

## Monday, October 25

### 9:00 A.M.

**Properties of Metals and Alloys**

*"Room and Elevated Temperature Properties of Some Sand Cast Magnesium-Base Alloys Containing Zinc,"* by T. E. Leontis, Dow Chemical Co. AIME.

*"Low Temperature Properties of Tin and Tin-lead Alloys,"* by H. S. Kalish and F. J. Dunkerley, University of Pennsylvania. AIME.

*"Thermal and Electrical Properties of Ductile Titanium,"* by E. S. Greiner and W. C. Ellis, Bell Telephone Laboratories, Inc. AIME.

*"Property Changes During Aging,"* by A. H. Geisler, General Electric Co. AIME.

**Microscopy and Grain Brow th**

*"Correlation of Optical and Electron Microscopy,"* by J. S Bryner, Pennsylvania State College. AIME.

*"Fractographic Study of Cast Molybdenum,"* by C. A. Zapffe, F. K. Landgraf and C. O. Worden, Metallurgists, Baltimore. AIME.

*"Effect of Composition on Grain Growth in Aluminum-Magnesium Solid Solutions,"* by L. J. Demar, Murray Co., Inc., and P. A. Beck, University of Notre Dame. AIME.

*"Effect of a Dispersed Phase on Grain Growth in Aluminum-Manganese Alloys,"* by P. A. Beck, M. L. Holzworth and Philip Sperry, University of Notre Dame. AIME.

### 9:30 A.M.

*"Isothermal Decomposition of Martensite and Retained Austenite,"* by B. L. Averbach and

**Schedule for Exposition to be Held at Convention Hall**

| | Open | Close |
|---|---|---|
| Monday, Oct. 25 | 12:00 noon | 10:00 p.m. |
| Tuesday, Oct. 26 | 12:00 noon | 10:00 p.m. |
| Wednesday, Oct. 27 | 12:00 noon | 10:00 p.m. |
| Thursday, Oct. 28 | 10:00 a.m. | 6:00 p.m. |
| Friday, Oct. 29 | 10:00 a.m. | 6:00 p.m. |

## 30th Annual National Metal Congress and Exposition
## October 25 through 29, 1948

Headquarters for the four participating societies are as follows:

**American Society for Metals**—Benjamin Franklin Hotel, 9th and Chestnut Sts.

**American Institute of Mining and Metallurgical Engineers**—Adelphia Hotel, 13th and Chestnut Sts.

**American Welding Society**—Bellevue-Stratford Hotel, Broad and Walnut Sts.

**Society for Non-Destructive Testing**—Benjamin Franklin Hotel.

Morris Cohen, Mass. Institute of Technology. ASM.

"*Dimensional Stability of Steel*," Part IV—Tool Steels, by B. S. Lement, B. L. Averbach and Morris Cohen, Mass. Institute of Technology. ASM.

"*Transformation and Retention of Austenite in SAE 5140, 2340 and T 1340 Steels of Comparable Hardenability*," by A. R. Troiano, University of Notre Dame. ASM.

"*Microstructure of Low-Carbon Steel*," by R. L. Rickett and F. C. Kristufek, United States Steel Corp. ASM.

### Ship Design

"*New Factors in the Design and Welding of Ships*," by Milton Forman, Battelle Memorial Institute. AWS.

"*Riveted v. Welded Structure*," by E. M. MacCutcheon, David Taylor Model Basin, USN. AWS.

"*Repair of Welded Ships*," by L. E. Bledsoe, Newport News Shipbuilding & Drydock Co. AWS.

"*Evaluation of Effects of Residual Stresses*," by T. W. Greene, The Linde Air Products Co. AWS.

### Railroad

"*Submerged-Arc Welding of Box and Hopper Cars*," by E. A. Watson, American Car & Foundry Co. AWS.

"*Welding the Modern Diesel Locomotive*," by H. S. Swan, American Locomotive Co. AWS.

"*General Welding Practices in Locomotive and Car Shops*," by J. Michne, New York Central System. AWS.

### Storage Tanks, Pressure Vessels and Piping

"*Field Erected Storage Tanks of Aluminum*," by Fred L. Plummer, Hammond Iron Works. AWS.

"*Sampling of Welds by Trepanning and Allied Methods*," by R. B. Lincoln, Pittsburgh Testing Laboratory. AWS.

"*Pipe Welding*," by John H. Zink, Heat & Power Corp. AWS.

"*Effect of Fabrication Processes on Steels Used in Pressure Vessels*," by C. J. Osborn, A. F. Scotchbrook, R. D. Stout, and B. C. Johnston, Lehigh University. AWS.

## 2:00 P.M.

### Properties of Metals and Alloys

"*Factors Affecting the Tensile Notch Sensitivity of Magnesium Alloy Extrusions*," by I. Cornet, University of California. AIME.

"*Effect of Grain Size on Tensile Strength Elongation and Endurance Limit of Deep Drawing Brass*," by H. L. Walker and W. J. Craig, University of Illinois. AIME.

"*A Copper-Base Alloy Containing Iron as a High-Strength, High-Conductivity Wire Material*," by Webster Hodge, R. I. Jaffee, J. G. Dunleavy and H. R. Ogden, Battelle Memorial Institute. AIME.

"*A High Strength-High Conductivity Copper-Silver Alloy Wire*," by Webster Hodge, R. I. Jaffee, J. G. Dunleavy and H. R. Ogden, Battelle Memorial Institute. AIME.

### Constitution and Precipitation

"*Cobalt-Chromium Binary System*," by A. R. Elsea, A. B. Westerman and G. K. Manning, Battelle Memorial Institute. AIME.

"*Solubility of Iron in Solid Aluminum*," by J. K. Edgar, Aluminum Research Laboratories. AIME.

"*Mechanism of Precipitation in a Permanent Magnet Alloy*," by A. H. Geisler, General Electric Co., and J. B. Newkirk, Carnegie Institute of Technology. AIME.

"*Some Effects of Applied Stresses on Precipitation Phenomena*," by W. L. Finlay, Remington Arms Co., and W. R. Hibbard, Jr., Yale University. AIME.

"*Influence of Ni and Mo on Isothermal Transformation of Austenite in Pure Fe-Ni-Mo Alloys Containing 0.55 Carbon*," by D. A. Scott, W. M. Armstrong and F. A. Forward, University of British Columbia. ASM.

"*Transformation Characteristics of Ten Selected Nickel Steels*," by J. P. Sheehan, Armour Research Foundation, C. A. Julien, Naval Research Laboratory, and A. R. Troiano, University of Notre Dame. ASM.

"*Metallography and Heat Treatment of 8 to 10 Pct Nickel Steel*," by G. R. Brophy and A. J. Miller, International Nickel Co. ASM.

"*Predicting the Effect of Complex Tempering Cycles*," by J. L. Waisman, Douglas Aircraft Co. and W. T. Snyder, Herff Jones Co. ASM.

## Schedule of Educational Lecture Series

"The Metallurgy of Arc Welds in Steel," by R. D. Stout, Lehigh University. Monday, October 25, 4:30 p.m. AWS.

"Properties of Metals in Materials Engineering," Monday, October 25, 4:15 p.m. and 8:00 p.m. and Tuesday, October 26, 4:15 p.m. and 7:30 p.m. ASM.

"Metallurgy and Magnetism," Monday, Tuesday and Wednesday, October 25, 26 and 27, 5:15 p.m. ASM.

"Grain Growth in Industrial Metallurgy," Tuesday, October 26, 8:30 p.m. Wednesday, October 27, 4:15 p.m. and 8:00 p.m., Thursday, October 28, 4:15 p.m. ASM.

## 8:00 P.M.

### Adams' Lecture

"*Adams' Lecture*," by G. E. Claussen, Reid-Avery Co. AWS.

## Tuesday, October 26

## 9:00 A.M.

### Plastic Deformation

"*Statistical Rate Theory of Metals—Mechanism of Flow and Application to Tensile Properties*," by J. W. Fredrickson and Henry Eyring, University of Utah. AIME.

"*Influence of Size and the Stress System on the Flow Stress and Fracture Stress of Metals*," by D. J. McAdam, Jr., G. W. Geil, D. H. Woodard and W. D. Jenkins, National Bureau of Standards AIME.

"*Nucleation of Slip Bands*," by J. G. Leschen, R. P. Carreker and J. H. Hollomon, General Electric Co. AIME.

"*Transient Plastic Deformation*," by R. P. Carreker, J. G. Leschen and J. D. Lubahn, General Electric Co. AIME.

### Rod and Wire Production Practice

"*An Appraisal of Wire Products in Industry*," by W. F. Hodges and T. S. Fuller, General Electric Co. AIME.

"*Production of High-Carbon Steel Wire*," by C. W. Garrett, Jones & Laughlin Steel Corp. AIME.

"*Hot Rolling and Cold Drawing of Some of the Corrosion and Heat Resisting Alloy Rods and Wire*," by J. K. Findley, Allegheny Ludlum Steel Corp. AIME.

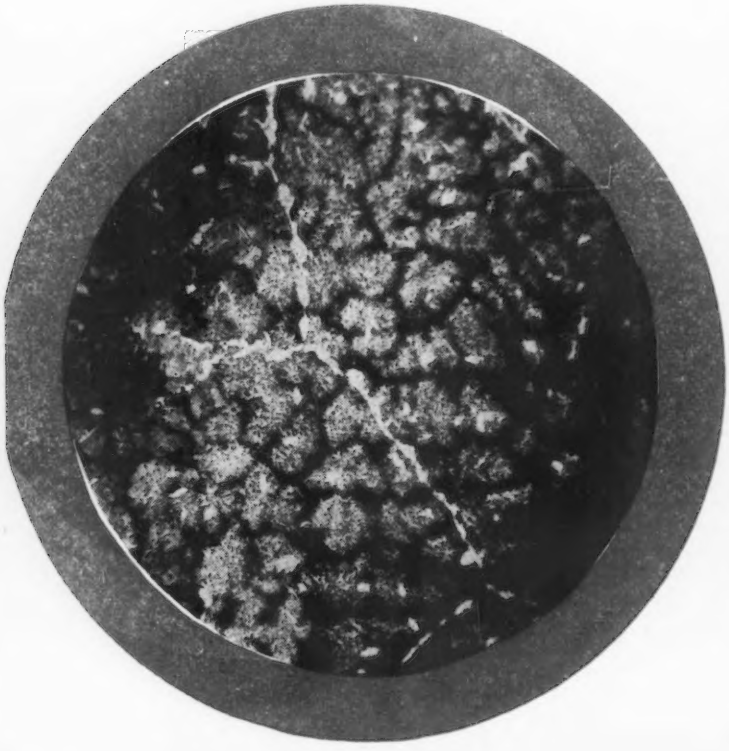
"*Hot and Cold-Working of Nickel-Copper Alloy Rods and Wire*,"

(CONTINUED ON PAGE 239)

# As-Cast Structures In Cast Steels

FIG. 1—Evidence of former dendrites in as-cast 0.36 pct. Mn-Mo steel. Nital-picral etch. 10X.

FIG. 2—Evidence of former dendrites and former austenite grain boundaries in NE 9430 steel as-cast. Nital-picral etch. 25X.



ALL expressions based on the word *dendrite* owe their existence to the fact that almost all metal or alloy castings freeze in the following way: When the liquid metal cools to the freezing temperature, minute (submicroscopic) particles of solid metal begin to form at various places throughout the liquid where it is coolest. As time proceeds, these so-called nuclei grow in size, and additional solid nuclei form throughout the liquid.

All solid metals are crystalline, and the nuclei from which the grains of a solid casting have grown are merely tiny individual crystals, i.e., groups of a few hundreds or thousands of atoms held together solidly and arranged in a nearly perfect geometric pattern. In steels, as the nuclei grow during freezing of the casting, this pattern first takes on the form of a skeleton with regularly spaced branches and sub-branches placed at right angles to one another.

As freezing of the steel continues, these dendrites not only spread branches out in all directions into the remaining molten steel, but also these arms grow in thickness; i.e., solid metal keeps freezing out on all the branches until the hollow spaces in the skeleton are solidly filled in and such growth has to stop. The spreading out of the branches to increase the overall size of the growing dendrite also has to come to a stop eventually, caused by the growing together of it and other nearby dendrites. These two processes convert all the molten steel to solid steel and constitute the freezing of the casting.

The term *as-cast* brings up a matter to be kept in mind, particularly when steel castings are being considered. In some metals and alloys, notably iron and steel, the as-cast grains can

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AND
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*Carnegie Institute of Technology*
*Pittsburgh*

never be seen by examining the casting at room temperature. This is because one or more changes occur in the steel on cooling after freezing. In all except rather high carbon and/or rather high alloy cast steels,* the dendrites growing from the molten steel have a particular crystal structure; this solid steel is called delta ferrite. Slightly before, during, or after the completion of freezing, the solid atoms of iron and carbon forming the delta ferrite rearrange to form a different type of crystal structure; the solid steel in this state is called austenite.

** The limits are not known accurately; but if the carbon or alloy content is high enough, austenite dendrites and grains form directly during the freezing of the molten steel.*

Delta ferrite transforms to austenite in a manner very similar to that of the original freezing; i.e., nuclei of austenite form, usually at delta grain boundaries, and grow out into the delta iron until the latter is totally consumed. (This is not dendritic growth; dendrites form only from liquid.) The result is an aggregation of austenite grains similar to the former delta grains. The new grains will not be in quite the same places and may be finer and more numerous because several austenite nuclei may have formed in each delta grain.

This picture is further complicated, because the austenite changes to one or more other structures before the casting cools to room temperature; in fact when the casting is examined under a microscope at room temperature, one may see a variety of structures. This subject is discussed later in this article. It is sufficient to say here that certain features of the microstructure at room temperature can often be used to deduce information about the previous dendrites and austenite grains.

Fig. 1 is a photograph of as-cast steel magnified 10 times. It shows clearly evidence of former dendrites. How this is done will be explained shortly.

Fig. 2 shows a similar steel at 25X. The higher magnification and the fact that the former dendrites themselves are larger in this steel (because of slower freezing) makes it impossible to see entire dendrites. Instead the cross-sections of former dendrite arms are shown by the dark cell-like outlines. The position of former austenite grains is also shown by the white outlines which are made up of tiny alpha ferrite grains which nucleated and grew in the former austenite grain boundaries as the solid casting cooled to room temperature. Portions of five former austenite grains are clearly shown. Just how many former delta ferrite dendrites were present cannot be ascertained precisely from the photomicrograph, but there were undoubtedly less than five; obviously two or three austenite grains nucleated and grew within the large delta ferrite dendrite of the right of the photomicrograph.

Such evidence of small austenite grains within larger dendrites lead many metallurgists to accept the early postulation[1] of a mysterious process called granulation of dendrites. This postulation was made before the existence of delta ferrite and its subsequent transformation to austenite were fully understood. It no longer seems necessary or advisable to consider granulation when known facts can explain the difference

***An understanding of the origin and characteristics of dendritic and as-cast structures in cast steels is essential not only in the ingot phase of steelmaking but also in wrought steel operations, for dendritic segregation causes banding and affects hardenability. An explanation of the phenomenon occurring in the course of solidification of alloy as well as plain carbon cast steels is presented herein, supplemented with a metallographic study giving examples of almost every type of cast steel structure in which the influence of dendritic segregation is prominent.***

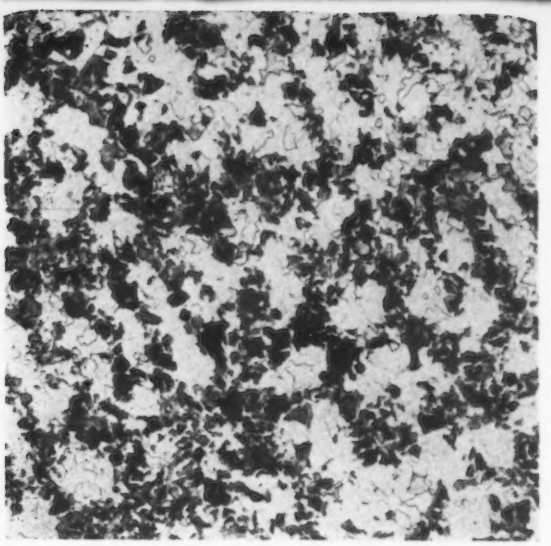


FIG. 3—Evidence of dendritic segregation brought out by secondary redistribution of carbon during the slow cooling following annealing at 1600°F. NE 8630 cast steel. Nital-picral etch. 100X.

FIG. 4—Structure similar to that of fig. 3 except that ferrite instead of pearlite is situated in interdendritic spaces. Probably an annealed high phosphorus cast steel. (V. N. Krivobok.)

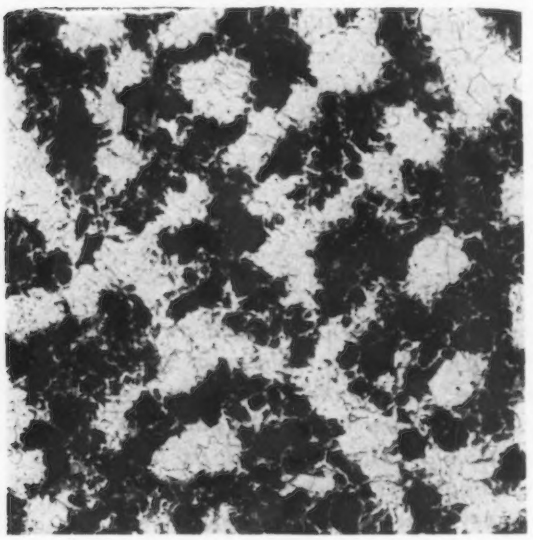


FIG. 5—Secondary redistribution of carbon in NE 9430 cast steel very slowly cooled from 1600°F. Nital-picral etch. 100X.

in size and position of former austenite grains and former dendrites.

It is possible to see evidence of former dendrites in an alloy, such as cast steel, but not in a perfectly pure metal. In almost all pure metals or alloys freezing occurs by means of dendritic growth, but in pure metals the last portions of liquid to freeze (in the spaces between dendrite arms) are exactly like the initial nucleus and the primary dendrite axes. The atoms are all the same; therefore, when the casting is completely solid and all the grains have grown together, there is no way of telling where the axes or branches or spaces between the branches of the dendrites used to be.

On the other hand, in a cast steel, there are many different kinds of atoms (iron, carbon, manganese, silicon, sulfur, phosphorus, and at least traces of nickel, chromium, molybdenum, etc.), and they do not freeze out in the same ratio as they exist in the liquid steel. The nuclei have a greater ratio of iron atoms than the liquid, but as the dendrites grow the proportion of atoms other than iron freezing out increases. Finally the last steel to freeze (which fills in between the branches of the dendrite skeletons) has dissolved in it a fairly high concentration of atoms other than iron; it is higher in fact than the average concentration which existed in the molten steel before it began to freeze.

The phenomenon just described is called dendritic segregation,* and evidence for it is shown by the dark cell-like outlines in fig. 2. These are

** Not to be confused with macro-segregation, such as from surface to center of a large ingot.*

the spaces between former dendrite arms in which there is a high concentration of atoms other than iron. This concentration can affect various subsequent processes which in turn can be used to show where the dendrites used to be: It can cause a difference in the type or distribution of structures to which austenite transforms on cooling to room temperature, and it can change the rate at which even a single structure (such as martensite) containing the segregated atoms in solution will be attacked by the etching reagent used to bring out the microstructure. Undoubtedly both these mechanisms contribute to the appearance of the dark rings in fig. 2, although the magnification is too low for one to tell.

An obvious question is: Why do not all photomicrographs of cast steel show evidence of dendritic segregation? The answer is, they almost all do: it is just more obvious in some cases than others.

There are several reasons for this; one is that although some dendritic segregation always occurs during the freezing of a cast steel, the segregation is more severe in some cases than others; in other words some elements are more prone to segregate than others; phosphorus is a notable example.

Secondly, there is a constant tendency, once solidification is completed, for segregation to be reduced and eliminated by means of all the atoms

diffusing through the solid crystals (grains) until they are uniformly distributed. This is hastened slightly by keeping the steel at a very high temperature (homogenization) and by hot working. The former is not very effective[2], and the latter is not much more so for the banding observed so often in wrought steel results from the rolling out of former dendrites.

Further, some elements are inherently slower to diffuse through steel than are others. Typical are elements with atoms similar in size or larger than iron atoms such as manganese, nickel and molybdenum. Small atoms such as carbon diffuse thousands of times faster; thus plain carbon cast steels are usually less segregated by the time they cool to room temperature than are alloy cast steels.

In addition to the true differences in severity of dendritic segregation discussed above, there are two deceptive sets of circumstances which can make the microstructure of a cast steel appear to show evidence of more severe segregation than actually exists in the steel. In other words, these can make one steel appear to be more segregated than a second when the reverse is really true. Both of these sets of circumstances are more apt to be met in annealed or normalized cast steels than in steels in the as-cast state.

The first circumstance is a secondary redistribution of carbon during the transformation of austenite to ferrite on slow cooling below the $A_1$ temperature, and it results from dendritic segregation in the following ways. As the segregated steel cools below $A_3$, the first areas in which ferrite nucleates will most likely correspond to the centers and main branches of former dendrites. This is because the higher concentration of alloying elements in the interdendritic areas slows down the rate of transformation of austenite to ferrite there. If the cooling rate is very slow (as in annealing) the rate of nucleation of new ferrite grains will be slow compared with the rate of growth of the existing nuclei and grains. Therefore, the original ferrite grains at former dendrite centers and main branches will grow out into the remaining austenite toward the interdendritic area. As the low carbon ferrite grows, most of the carbon atoms have to concentrate in the remaining austenite, until finally in the interdendritic areas the carbon concentration becomes high enough and the temperature drops low enough for pearlite to form.

The result is illustrated in fig. 3 which shows extreme carbon segregation. This is not dendritic segregation; it is secondary redistribution of carbon during transformation on annealing caused by dendritic segregation of other elements during the original freezing. The severity of this secondary redistribution is not a measure of the severity of the primary dendritic segregation, because the former is greatly affected by other variables also. The importance of cooling rate as one of these variables will be emphasized in succeeding paragraphs.

First, however, a second type of carbon redistribution, just the opposite of that discussed above, should be mentioned. This second type is less common, for it requires extreme segregation of elements which have a great tendency to raise the $A_3$ temperature (strong ferrite stabilizers), and a very slow cooling rate. Given these conditions, as in dead soft annealing of high phosphorus steel, ferrite will nucleate during cooling in the interdendritic areas rather than where dendrite axes and main branches were formerly located. This is because under the conditions stated, the raising of the $A_3$ temperature by the segregated elements will outweigh their effect on transformation rate (the latter was the key to the first type of secondary carbon redistribution discussed).

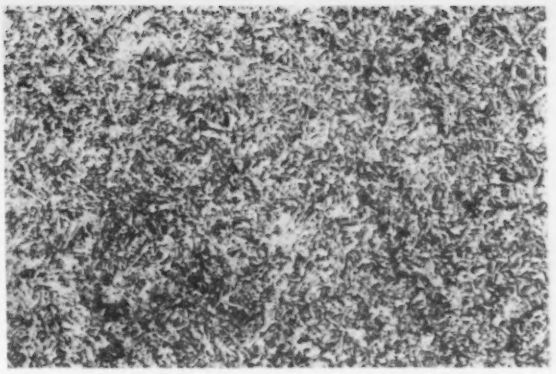
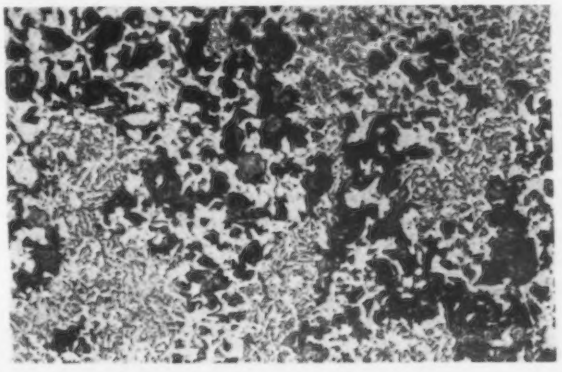


FIG. 6—Uniform distribution of carbon in same steel coupon as fig. 5; only difference is that air cooling from 1600° F was used. Nital-picral etch. 100X.

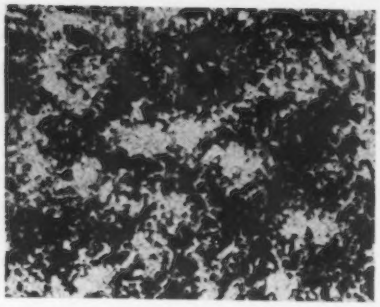
The rest of the process is the same as before. Very slow cooling promotes transformation at high temperature, which in turn promotes a relatively low rate of nucleation of ferrite with respect to rate of growth of the first nuclei formed; this in turn results in carbon concentrating in the remaining austenite (located where dendrite axes and main branches used to be) until finally the former dendrite centers transform to pearlite leaving the interdendritic areas ferritic.

This is illustrated in fig. 4 which is reproduced from the classic textbook of Sauveur[3]. Such structures are rarely seen today, for the phosphorus content of modern cast steels is kept reasonably low. Notice that the ferrite-pearlite distribution is just the reverse of fig. 3. The

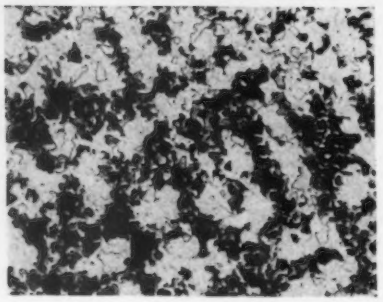
FIG. 7—Evidence of dendritic segregation brought out by a mixture of structure types (Widmanstatten ferrite and blocky ferrite). Same steel coupon as for figs. 5 and 6; only difference is that a cooling rate intermediate between the other two was used. Nital-picral etch. 100X.



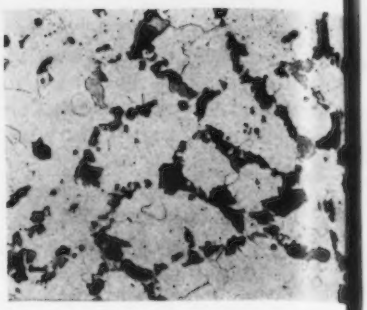
ANNEALED STRUCTURES



*Secondary redistribution of carbon; typical of low alloy 0.30 pct C cast steel.*

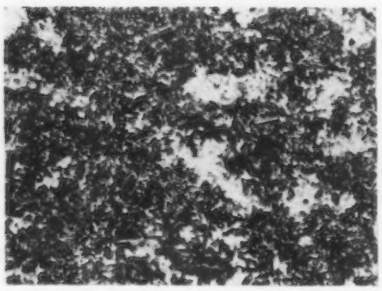


*Secondary redistribution of carbon; finer dendrites than in structure at left.*

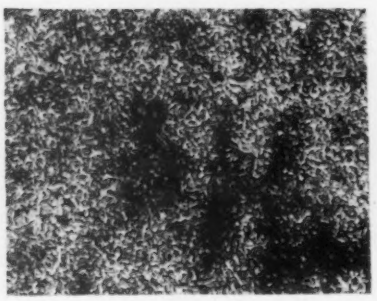


*Secondary redistribution of carbon; typical of 0.20 pct plain carbon cast steel.*

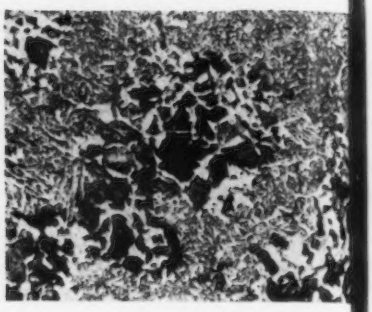
NORMALIZED STRUCTURES



*Martensite and Widmanstatten ferrite; alloy cast steel with rather high hardenability.*

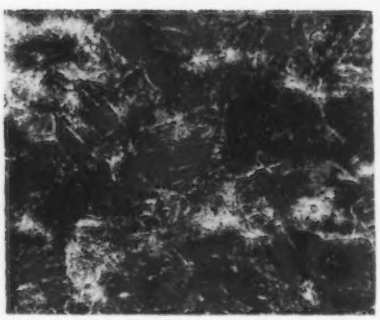


*Etching effect in Widmanstatten ferrite; slightly fine and more pearlite in dark areas.*



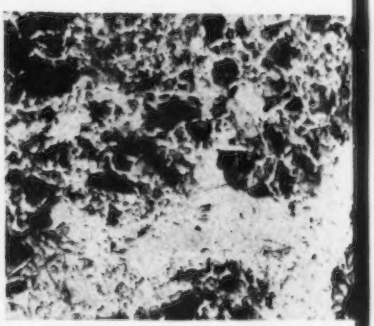
*Blocky ferrite and Widmanstatten ferrite.*

QUENCHED STRUCTURES



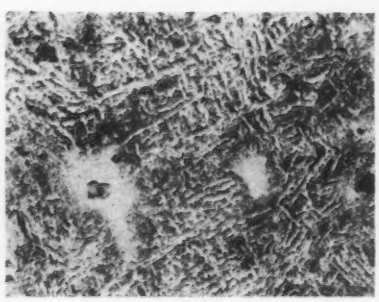
*Etching effect in martensite; tempered and etched in HCl—picral.*

*Martensite and bainite.*

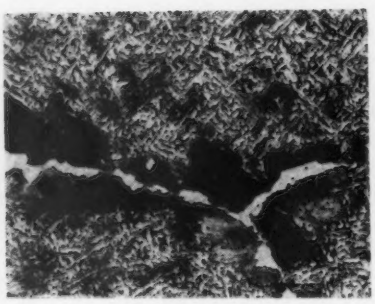


*Martensite and blocky ferrite-pearlite. 200X*

AS-CAST STRUCTURES



*"Intermediate structures" and martensite; typical deep hardening alloy cast steel.*



*Etching effect in Widmanstatten ferrite; typical low alloy cast steel.*

*Mixture of ferrite types; typical plain carbon cast steel.*

FIG. 8—Ways in which dendritic segregation is evidenced in cast steels. Hardenability of the steels is decreasing from left to right. All samples etched with Nital. 100X except as noted.

steel of fig. 4 was undoubtedly high in phosphorus, for that element seems to have the most pronounced effect in causing this "inverse" secondary redistribution of ferrite.

The effect is so pronounced that it has led many metallurgists to believe that phosphorus has a mysterious power to repel carbon and that carbon will always diffuse away from it.[1] Again it seems unnecessary to cling to pure hypothesis when proven fact will explain a phenomenon. Carbon does not diffuse away from phosphorus merely because that element is present; it diffuses away because the growth of ferrite sets up a carbon concentration gradient in the direction in which that ferrite grows. Given the proper conditions, phosphorus merely determines where that ferrite starts to grow. Under other conditions such as fast cooling rate which promotes rapid general nucleation of ferrite, carbon does not diffuse away from phosphorus at all.

Figs. 5, 6 and 7 illustrate this important effect of cooling rate. They show the structure of a single coupon of cast steel that has been reheated to 1600°F and cooled at three different cooling rates. The rate was very slow for fig. 5, and the secondary redistribution of carbon was possible. It is difficult to determine from the microstructure whether it was the first or second type of redistribution; i.e., it is difficult to tell whether it is the ferrite or pearlite that is located where the interdendritic areas used to be.

The cooling rate was rather fast (air cooling) for fig. 6, and the carbon (ferrite and pearlite) is now evenly distributed; the original dendritic segregation of phosphorus and alloying elements has not been changed, however. The faster cooling rate also has produced a finer size of ferrite and pearlite grains and a more plate-like distribution of ferrite.

This subject of different modes of distribution of ferrite in annealed and normalized cast steels introduces the second deceptive set of circumstances which may be encountered when one tries to deduce from a photomicrograph the severity of dendritic segregation in a cast steel. The fine plate-like or Widmanstatten ferrite shown in fig. 6 is common in cast steels cooled rather rapidly from the heat treating temperature; on the other hand, slow cooling rates produce large blocky grains of ferrite and pearlite as seen, for example, in fig. 5.

There would be a rather narrow range of cooling rates over which the ferrite distribution would suddenly change from one of these types to the other if it were not for another factor that also affects structure type; the alloy content of the steel. Where the alloy concentration is low, (as at the centers of former dendrite axes and branches), a faster cooling rate is required to produce Widmanstatten ferrite than is required where the alloy concentration is high (such as at the places which were interdendritic areas during freezing). Thus if a segregated cast steel is cooled at an intermediate rate (such as air cooling in thick sections) part of the structure may be fine Widmanstatten ferrite and part coarse blocky ferrite. This accentuates the evidence for dendritic segregation as illustrated in fig. 7. This is a photomicrograph of the same cast

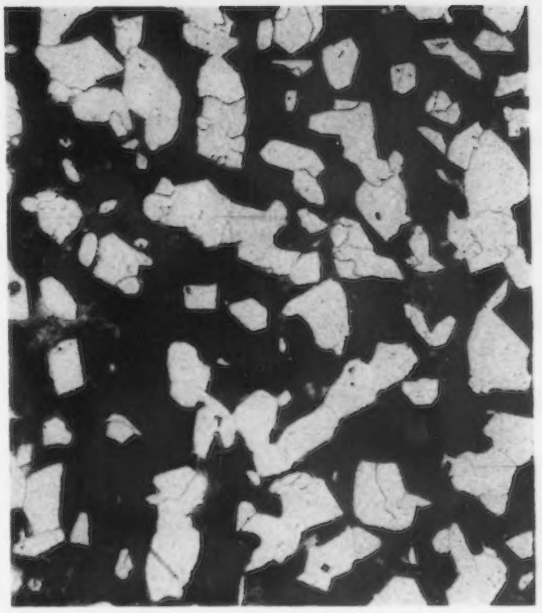


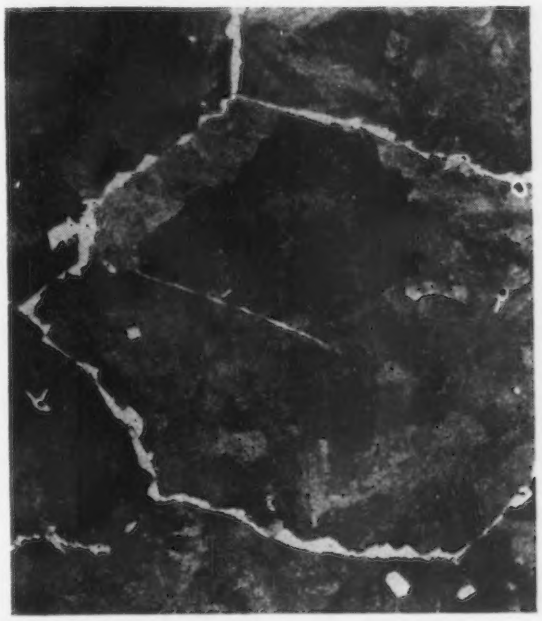
FIG. 9—Random blocky ferrite in NE 8630 steel; as-cast. Nital-picral etch. 100X.

steel coupon as used for figs. 5 and 6; the only difference is that a cooling rate intermediate between the other two was used.

This is only one example of the evidence for dendritic segregation being accentuated by a mixture of structure types. The same thing can happen with mixtures of Widmanstatten ferrite and martensite or mixtures of martensite and bainite in heat-treated cast steels or even in as-cast steels which are highly alloyed. Undoubtedly there are still other mixtures of structure types which can produce the same effect.

Figs. 5 and 7 both make the steel appear to have much more severe dendritic segregation than does fig. 6. Actually it is the same in all three samples, for the low temperature treat-

FIG. 10—Grain boundary ferrite plus pearlite in NE 8640 steel; as-cast. Nital-picral etch. 75X.



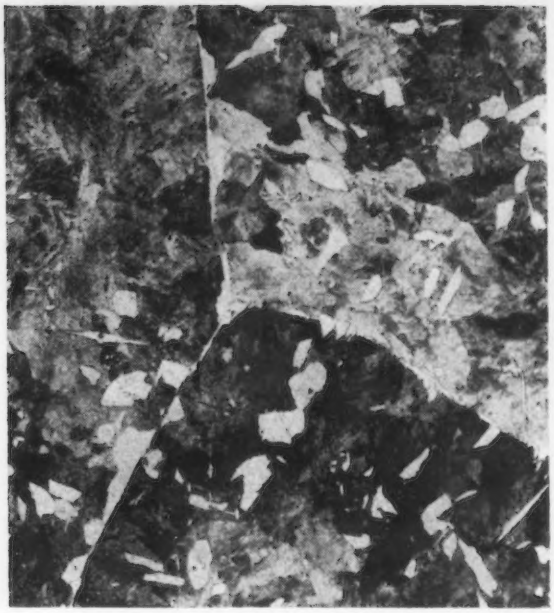


FIG. 11—Grain boundary ferrite plus idiomorphic ferrite and pearlite in NE 1330 steel; as-cast. Nital-picral etch. 100X.

FIG. 12—Coarse grain boundary ferrite plus blocky Ferrite within the grain in NE 8620 steel; dark areas are pearlite; as-cast. Nital-picral etch. 100X.

ments used have no effect on dendritic segregation. All three structures could be reproduced in succession any number of times in the same sample of this steel merely by reheating to 1600°F and cooling at the various rates.

The foregoing discussion should enable the reader to understand almost any cast steel microstructure showing evidence of dendritic segregation provided the composition and thermal history of the steel are known.

To aid in recognition of these structures, fig. 8 is presented, giving examples of almost every type of cast steel microstructure in which the influence of segregation is prominent.

### Microstructures of As-Cast Steels

The metallography of as-cast steel has received somewhat less attention than has been given heat-treated cast steel, largely because most steel castings are heat-treated, and the original as-cast structure does not exert great influence on the as-heat-treated structure. In the interest of a more complete understanding of cast steel metallography, however, it is of advantage to be able to recognize the basic types of as-cast structures and to know what factors influence them.

The solidification of cast steel of low or medium carbon and alloy content takes place by nucleation of delta ferrite dendrites, growth of these dendrites, and transformation of the dendrites to austenite, followed by continued growth until solidification is completed. The dendrite with all its branches and sub-branches thus ultimately constitutes several austenite grains.

In the higher carbon or alloy cast steels, solidification takes place by the direct nucleation and growth of austenite grains. In both cases the austenite grains, once formed, remain unchanged as they cool through the gamma range until they reach the $A_3$ and $A_1$ transformation temperatures. Since each dendrite is a solid solution, it freezes in cored fashion with the centers of the arms being nearest in composition to pure iron and the spaces between arms being richest in carbon, manganese, phosphorus, sulfur and all the other elements added to or incidentally present in commercial cast steel.

Carbon segregation in the austenite is undoubtedly rapidly eliminated, but this is not true for the other elements. Recognition of the dendritic segregation of these elements usually depends upon their effect on the nature and disposition of the decomposition products of the iron-carbon solid solution. Although this influence is frequently evident in as-cast steel, as will be seen, it is more often at least partially obscured by the bizarre appearance of the as-cast structure and may affect only the etching characteristics of the pearlite constituent in the final microstructure.

As-cast austenite grains, having grown at very high temperatures, are far larger than austenite grains which form in cast steel at ordinary heat-treating temperatures.[3] It is not uncommon for the average as-cast grain area to be 100 sq in. at 100 diameters; this is roughly 10,000 times the average grain area in heat-treated steel. Hardenability theory treats the effect of grain size within the limits normally found in heat-treated steels, and, although there is a hundredfold or thousandfold difference in grain size, it is presumed that this difference affects the austenite transformation process only in degree and not in kind. In other words, on cooling to room temperature these large as-cast grains of austenite transform to pearlite, ferrite, bainite, and martensite following the same rules which govern the decomposition of ordinary grains. By long range extrapolation it appears that these large grains confer on plain

FIG. 13—Widmanstatten ferrite plus pearlite in a 0.30 pct C steel; some grain boundary ferrite present; as-cast. Nital-picral etch. 100X.

FIG. 14—Somewhat finer Widmanstatten ferrite than shown in fig. 13; 0.30 pct C steel; as-cast. Nital-picral etch. 100X.

carbon steel about as much added hardenability as 0.6 pct Cr.

Thus there are in cast steel two important factors that cause the development of somewhat different appearances from those arising out of the decomposition of the austenite grains in wrought steel of the same average composition; (1) dendritic segregation (which is rolled or forged into bands in wrought steel), and (2) extremely large grain size.

A third factor of somewhat lesser magnitude is that a greater range of cooling rates also prevails among castings during the original cool than is commonly encountered in wrought products of comparable analysis. These vary from the air cooling of thin sections from red heat to the slow cooling of large sections in pit molds.

Most steel castings are relatively low in carbon and hence transform to ferrite and pearlite on cooling slowly to room temperature. The disposition of this ferrite governs the appearance of the final structure, the pearlite merely forming in the areas of austenite which do not transform to ferrite. These differences in outward appearance of ferrite do not affect the space lattice, chemical composition or orientation of the ferrite lattice with respect to the parent austenite lattice, all of which are identical for the various forms of ferrite.

If by reason of cooling rate or composition the pearlite forms at temperatures considerably below the equilibrium eutectoid temperature, the pearlite is more finely spaced, contains less carbon, and forms in greater quantity at the expense of ferrite than if it had formed at higher temperatures. This effect can cause a 0.30 pct C steel to contain perhaps 80 pct pearlite instead of the roughly 40 pct which would be present if formed under equilibrium conditions.

Slow cooling rates promote a random deposition of blocky grains of ferrite which are subsequently surrounded by pearlite. This is illustrated in fig. 9. Here presumably there has been opportunity for nucleation and growth of ferrite on many dendrite points. During their slow growth, these ferrite grains remain roughly equi-axed and frequently develop straight sides; when having both these characteristics they are described as being idiomorphic. This random blocky ferrite is frequently seen in partially decarburized areas even when the body of the casting has a decidedly different structure.

Fig. 10 illustrates a second way in which proeutectoid ferrite is seen in as-cast structures, here predominantly as grain boundary ferrite, with the remainder of the steel largely pearlite. This is associated with slightly higher alloy or carbon content or slightly faster cooling rates and with more homogeneous austenite. Under these conditions the advantage of the grain boundary for nucleation asserts itself.

Sometimes the grain boundary ferrite is quite thin, as in fig. 11, and there are also idiomorphic ferrite grains in the body of the as-cast austenite grain. Another example of grain boundary ferrite associated with blocky ferrite grains within the body of the former austenite grains is shown in fig. 12, but here the grain boundary ferrite is much less predominant than in fig. 11.

Another basic structure type is the Widmanstatten structure illustrated by fig. 13. Here there has been general nucleation of ferrite plates which, in a given grain, have their sides parallel to one of three directions which are related to crystallographic directions in the original austenite grain. The term Widmanstatten refers to a fixed relation between the external form of a plate-like precipitate phase and the space lattice of the parent grain. In addition to the Widmanstatten ferrite plates in fig. 13 some grain boundary ferrite also has formed; this is the usual case and illustrates the proclivity of

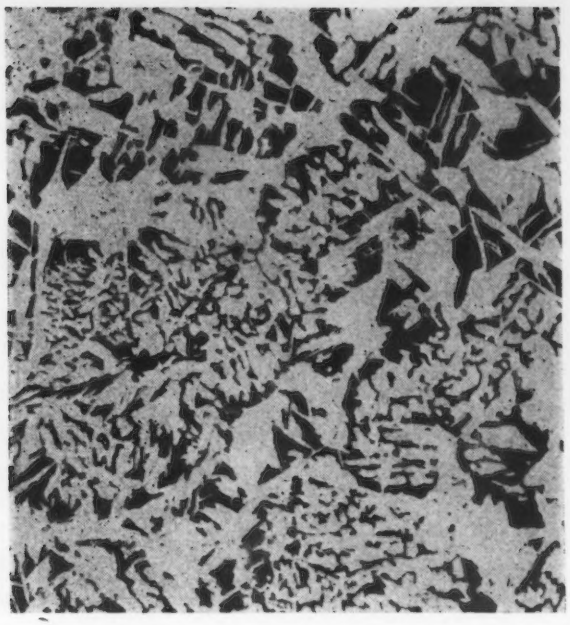


FIG. 15—Same steel as that of fig. 14, somewhat slower solidification and cooling rates, giving rise to coral-like clusters of ferrite grains, grain boundary ferrite, and some Widmanstatten ferrite; as-cast. Nital picral etch. 100X.

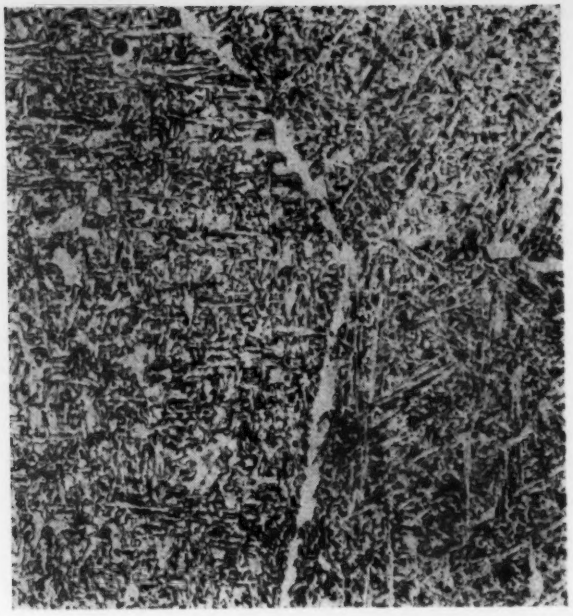


FIG. 16—Fine Widmanstatten ferrite plates (and grain boundary ferrite) such as are frequently observed in alloy steels. NE 8630 steel; as-cast. Nital-picral etch. 100X.

the grain boundary to nucleate ferrite. The Widmanstatten ferrite structure in a given steel is associated with faster cooling velocities than those which promote pure grain boundary ferrite.

Still faster cooling rates promote finer Widmanstatten plates (fig. 14); slightly slower rates than this tend to promote the degeneration of the ferrite to equi-axed grains in coral-like clusters (fig. 15). Figs. 14 and 15 illustrate these structures developed in the same heat of 0.30 pct C steel cooled from the solidification temperature at two different rates.

The large Widmanstatten plates seen in fig. 13 are most frequently found in plain carbon steels. In alloy steels, any Widmanstatten ferrite which may form tends to be fine, as in fig. 16. In any event, as the cooling rate increases, the Widmanstatten tendency will get stronger and stronger in any steel right up to the critical cooling velocity where ferrite can no longer form at all (bainite or martensite then forms). Note that this is contrary to another frequently expressed erroneous hypothesis[1] that Widmanstatten ferrite is favored by some cooling rate intermediate in the range over which ferrite can form. At the fastest rates where ferrite can form at all, and where it will hence be associated with bainite or martensite, it will have the finest and most pronounced geometric pattern.[4]

Dendritic segregation and grain boundary influences on the rate of transformation of austenite may give rise to a range of proeutectoid ferrite types in the same specimen—grain boundary ferrite, idiomorphic blocky ferrite in the body of the grain, and Widmanstatten ferrite plates perhaps dendritically disposed as in fig. 17. Dendritic segregation may also be evident in the etching characteristics of fine Widmanstatten

FIG. 19—Acicular products (bainites and perhaps some X-constituent and martensite) in steel containing 0.41 C, 0.36 Si, 0.024 S, 0.046 P, 0.85 Mn, 0.69 Cr, 1.49 Ni, and 0.29 Mo; as-cast. Nital-picral etch. 100X.

TABLE I

Comparison of Mechanical Properties of 0.29 Pct. C Steel, As-cast and As-Heat-Treated.

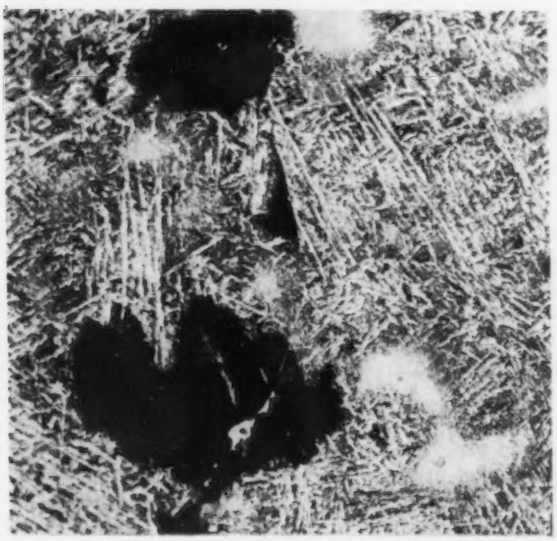
| | As-Cast | Normalized and Tempered | Quenched and Tempered |
|---|---|---|---|
| Tensile strength, Psi | 73,000 | 73,000 | 80,000 |
| Yield strength, Psi | 38,000 | 40,000 | 46,000 |
| Reduction of area, Pct | 36 | 57 | 61 |
| Elongation, Pct | 25 | 30 | 25 |
| Charpy impact strength, Ft-lb | 14 | 25 | 28 |

FIG. 17—Widmanstatten ferrite plates formed in dendritically disposed areas, grain boundary ferrite, and idiomorphic blocky ferrite in NE 8430 steel; as-cast. Nital-picral etch. 75X.

ferrite, as illustrated in fig. 18. Favorable nucleation and growth characteristics may cause the formation of ferrite areas which enrich the surrounding areas in carbon and thus cause them to transform to pearlite collars around the ferrite; this also is illustrated in fig. 18.

With suitable alloy content it is possible that the casting may transform to bainite or martensite even on slow cooling in the mold (fig. 19). With a greater degree of dendritic segregation incurred by different freezing conditions, the steel of fig. 20 (essentially the same composition as that of fig. 19) has such a great variation in composition and hardenability from point to point that it has transformed to ferrite, pearlite, bainite, and martensite.

FIG. 20—Ferrite, pearlite, acicular products and martensite (in light areas) in steel containing 0.46 C, 0.34 Si, 0.028 S, 0.048 P, 0.86 Mn, 0.74 Cr, 1.40 Ni and 0.31 Mo. Note that this steel is of essentially the same composition as that of fig. 19. As-cast, nital-picral etch. 100X.



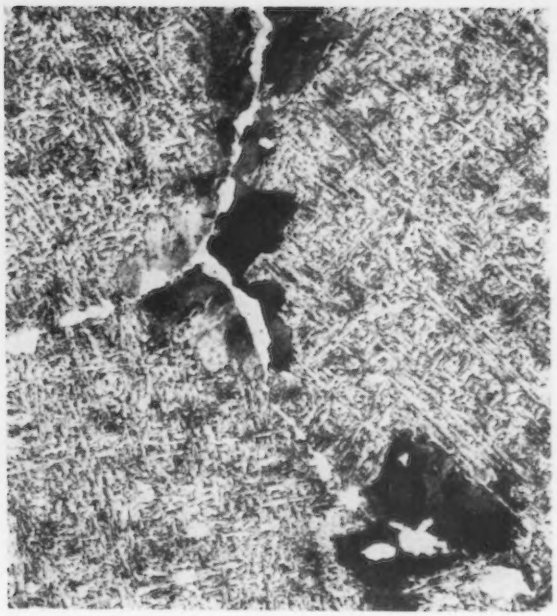


FIG. 18—Pearlite collars around ferrite areas in NE 8730 steel; as-cast. Nital-picral etch. 75X.

Structures commonly considered typical as-cast ones, such as that of fig. 14, are easily produced in unalloyed wrought steel by suitably cooling from 2000°F or more. Steel thus overheated generally has poor ductility, and these low ductility properties are associated with the similar coarse Widmanstatten and grain boundary structures of as-cast steel. This low ductility caused by the as-cast structure is not associated however, with any inferiority in the same properties of the heat-treated steel. In the absence of the large amount of direct comparison data which would be necessary, one can only conjecture about the relative mechanical properties of the various pearlite-ferrite aggregate types seen in as-cast structures.

*The researches leading to the conclusions expressed in this article were supported by the Steel Founder's Society of America. The helpful advice of its Technical and Research Director, Charles W. Briggs, is gratefully acknowledged by the authors.*

From the mechanical property data available for various structures found in heat-treated cast steels, one would infer that in as-cast steels fine Widmanstatten ferrite plates plus pearlite would give the best combination of strength and ductility, that a random blocky ferrite plus pearlite would be next best, and that pearlite plus grain boundary ferrite would be poorest. It is quite generally true that the mechanical properties of as-cast steels having any of these structures are considerably lower than for the same steels heat treated. Mechanical properties of one steel as-cast and as heat-treated are given in table I.

## References

[1] Sauveur, "The Metallography and Heat Treatment of Iron and Steel," University Press, 1926.
[2] Marcotte and Eddy, "The Effect of Homogenization on Cast Steels." Trans. ASM 40,649, 1948.
[3] M. F. Hawkes, "Austenite Grain Size in Cast Steels," Metals Technology, June 1947. Also, M. F. Hawkes, "Determination of Austenite Grain Size in Cast Steels," THE IRON AGE, 159,46, March 13, 1947.
[4] M. F. Hawkes and B. F. Brown, "The Microstructure and Mechanical Properties of Cast Steels," Paper to be presented to ASM, October 1948.

# The Alloy Steel Industry

IN reviewing the early development of constructional alloy steels, it is surprising that some of the early applications turned out as well as they did. The standard test, for example, for a good heat treated gear was to scratch it with a file and hit it with a sledge hammer. If it was file hard and didn't break when struck, the gear was considered acceptable. Such a gear today would probably still represent a good gear in many applications.

Hardenability, the most important single characteristic of any alloy by today's criteria, was a subject not uncovered or understood until some time later. The alloys were nevertheless applied in such a manner that the early choices of alloy compositions proved quite sound. Many of the same types of chemistries are still popular today.

A striking fact, as the old timers will attest, in the development of alloy steels, is that alloy steels were available and were being used long before industry knew anything about proper heat treating. In fact, the heat treatment practice of the early days was so poor that the early alloy steels that are best remembered by these old timers are the types of alloy steels that failed.

In the very early history of the constructional alloy steels the French, British and Germans devoted considerable time to the development of chromium-nickel steel running 0.75 to 2.00 pct Cr and 3 to 5 pct Ni. The French played a major role in the development of chromium steel while the British concentrated on manganese-silicon steel. A little later all early investigators concentrated on either nickel or chromium-nickel steels. In fact, the first recognized constructional alloy steel modified to suit various purposes, were either straight nickel steels (like the present day 2300 and 2500 series, 3½ and 5½ pct Ni, respectively), or 3100, 3200, 3300 and 3400 chromium-nickel steels running from 0.75 to 1.75 Cr and 1.0 to 4.0 pct Ni.

Stodart and Faraday made nickel steel back about 1818 by fusing horseshoe nails with 3 pct and 10 pct of pure Ni in an air furnace. The former alloy was said to be quite as malleable and pleasant to work under the hammer as pure iron. In the case of the latter alloy, the metals were perfectly combined but the alloy was less malleable and more disposed to crack under the hammer.

*The editors of* THE IRON AGE *are grateful for the generous assistance accorded them by the many authorities consulted in the preparation and checking of this article.*

Earliest records available indicate that Mushet of Great Britain discovered the first air hardening high tungsten tool steel in 1860. In 1893 Sir Robert Hatfield secured patents on a manganese steel, very similar in composition to that used for helmets during the last war. Between 1890 and 1900, nickel steels were used in this country in battleship armor.

The advantages of nickel steel in ordnance led to its use in the manufacture of guns of heavy caliber. The fact that the propeller shafts of the gigantic double screw express steamer Deutschland, launched in 1889, were made of nickel steel is evidence of the remarkable progress made in the manufacture and application of this steel.

Brustlein, in France during the period 1877 to 1886, took advantages of the properties conferred on steel by chromium and initiated the use of chromium steels in munitions and armament. He was probably the first to recognize the importance of the correlative effect of chromium and carbon.

Extending back into the 1880's the then Midvale Steel Co. had engaged in the manufacture of alloy steels for naval armor piercing projectiles and for guns. The metallurgy of the former was based on low alloy chromium steels and the latter on nickel steels although later on both products were of 3 pct Ni and still later better performance, demanded of projectiles, brought nickel

## —its early history

***The history of the development of the alloy steel industry is a story of perseverance, foresightedness, common sense and a modicum of good luck. Despite the technological handicaps of that time, some of the ideas and chemistries of more than a half century ago have stood up remarkably well with the passing of time. This article is a modest compendium, prepared by the editorial staff of THE IRON AGE, of the trials, tribulations and successes of the early days of the alloy steel industry.***

and chromium together in this type of alloy steel. The entry into heavy armor plate production was a venture into low alloy nickel-chrome steel manufacture. Experience with chromium steel went back to the melting in crucibles of steel for the rolling of staves in 1872 for the Eades bridge over the Mississippi River at St. Louis.

The effect of molybdenum was brought out rather interestingly in the form of an unsigned letter which appeared in Stahl und Eisen in 1896, which asserted that a steel containing 2 pct Mo has a silver-white color, a velvety fracture and exceptional hardness. In 1894, Blair mentioned that the addition of 1 pct Mo to an otherwise good steel rendered it red-short and worthless.

One of the first industries to use nickel steel was the bicycle industry which employed it as tubing and used compositions similar to the present 2512 and 2320 grades. This industry later discovered that an alloy steel was not required for the application and changed the chemistry to straight carbon types. The Pope Tube Works in Hartford first adapted the alloy steels for use in the manufacture of the Columbia bicycle in 1898 to 1899.

In 1899 a nickel steel axle was introduced into an automobile by Haynes and Apperson, and the car made successfully a trip from Kokomo, Ind., to New York, a distance of about 1000 miles without serious breakage of any kind. This axle was made by Bethlehem Steel Co. and as far as is known, it was the first material of this kind ever used in an automobile. Nickel steel was used in the axles of cars of this type for about 5 years, and not a single case of breakage occurred during that period. Not only was this steel found to be practically free from crystallization, but it possessed a very high elastic limit—about 70,000 or 80,000 lb—and a tensile strength of over 100,000 lb, with an elongation of about 15 or 20 pct.

Heat treatment, in the early days, was an art which had developed in the shops while the authorities of the day were engaged in verbal combat concerning the theory underlying the processes used. Those deep in the know of steel treating guarded their procedures as secrets not to be lightly traded. The management of the Midvale Co. of that day, for example, insisted on furnishing Special Automobile Steel Class II fully heat treated and held out against divulging to customers how they could get the best properties from it by treatment in their own shops. Starting with brand names such as Packard, Pierce-Arrow, Peerless, Buick, Locomobile, etc., steels were standardized as Midvale's Nos. 1, 2, 3, 11 and 12 automobile alloy steels.

Also in the period just prior to 1900 Krupp developed chromium-nickel steels which were intended for armament uses. In this country, Carpenter Steel Co., Homestead Steel Co., Crucible Steel Co. and Bethlehem, as well as other companies, began manufacture of variations of chrome and nickel steels for armament and automotive parts. In this connection this interesting announcement, couched in the language of the day, appeared in THE IRON AGE, Aug. 25, 1898: "Officers of the Ordnance Bureau of the Navy Department tested the first armor plate made in this country under the Krupp process, the secrets of which were recently acquired by Carnegie Steel Co. The plate developed qualities little short of marvelous."

Automotive parts made from the chrome and nickel alloys were axles, knuckles, arms, gears, etc., and were made under specific proprietary trade names. These steels served as a basis for later standardization of the 2300 and 2500 nickel steels and 3100, 3200, 3300 and 3400 chromium-nickel steels.

In 1905 Henry Souther became consulting engineer for the Association of Licensed Automobile Manufacturers and developed the first standard

Furnace No. 10

Heat No. 834 M. S. C. Monday, Aug 12/18/05

Passed for Spec. Cast. Cl. I. Melter E. Lafferty Grade Mid Spec Cast

Class aimed at Mid Spec. Cast. Steel. Lab. II Carbon aimed at .30

## Charge Ordered

| Stock No. | MATERIAL | |
|---|---|---|
| 1595 | Limestone | 9600 |
| 1623 | Basic Pig | |
| 1626 | Bessemer " | |
| 5 | Nickelchrome Skulls | |
| 5 | " " Scrap | |
| 1572 | " Oxide | |
| 379 | Hammer Scale | |
| 1629 | Pig | |
| 1518 | Fluor Spar | |

## Charge

| TIME | | | Total Charged | | |
|---|---|---|---|---|---|
| 6.40 7.45 | 2.30 | 3.00 | | | |
| 13000 | | | 13000 | | |
| 24000 | | | 24000 | | |
| 41000 | | | 41000 | | |
| 1600 | | | 1600 | | |
| 400 | | | | | |
| | | 2000 | 2000 | | |
| | 200 | | | | |

**Final Additions**

4.50 Total charge prior to Final Additions 81600

4.30 5.10 5.40

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1634 | Metallic Nic. | 270 | | | | | | | | 270 | |
| 1655 | Ferro Sil | | | 230 | | | | | | 230 | |
| 1652 | Spiegel | 1300 | | | | | | | | 1300 | |
| 1616 | Ferro Cr. | | 2140 | 1-6% | | | | | | 2140 | |
| 1408 | Al in Ladle | | 24 | | | | | | | 24 | |

Total Time 23 hours — Total Charge 85564

## Details of Melting

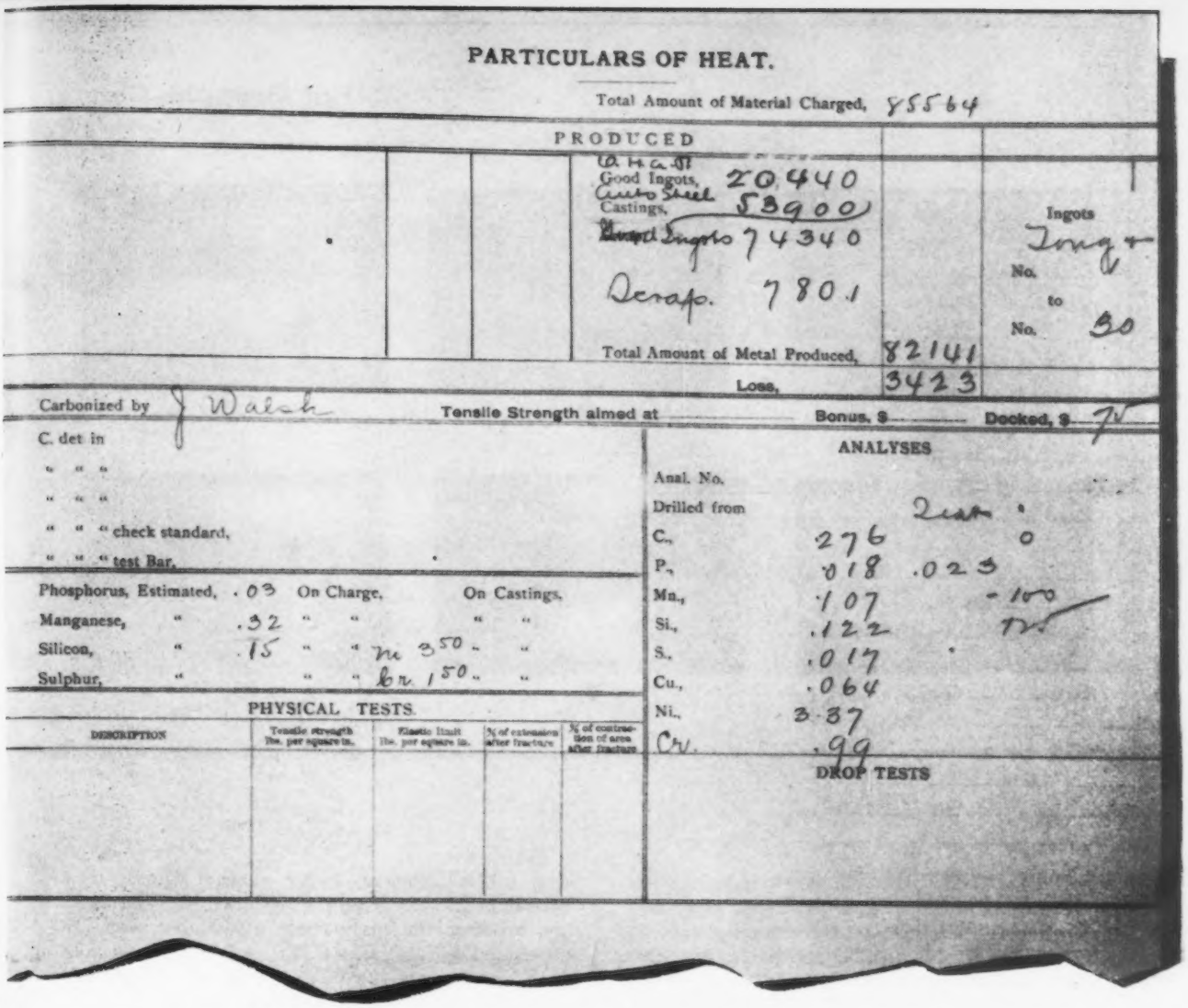
| | | |
|---|---|---|
| Working of Furnace, | | Slow |
| Time Melting First Charge, | | 18 hrs. 45 min |
| Before last charge prior to Final Additions | State of Slag, | heavy |
| | State of Metal, | Good |
| | Appearance of Tests, | Open Grain |
| | Estimated Carbon, | |
| | Determined Carbon, | Comb C. 043 |
| Additions with last charge prior to Final Additions | % of Carbon added, | 00 |
| | % of Manganese added, | 00 |
| | % of Silicon Added, | 00 |
| Time in of Last Charge Prior to Finals, | | — |
| Before Final Additions | State of Slag, | Creamy |
| | Appearance of Test, | Open Grain |
| | Carbon judged in Test, | .00 |
| | Manganese, judged in Test, | .02 |
| | Silicon judged in Test, | .00 |
| Additions Final | % of Carbon added, | .31 |
| | % of Manganese added, | .38 |
| | % of Silicon added, | .15 |
| Before Tapping | Appearance of Slag, | Creamy |
| | Test of Solidity | Raised |
| Time Casting, | | 30 min |
| Behavior of Metal in Moulds, | | Good |
| Size of Nozzle, | | 3" |
| Manner of Tapping, | | Ladle |

Coal Used, Hoppers, Lbs.

### MELTER'S REMARKS

Bottom in Good Condition
Made up with 4 Barrows
of Dolomite & Magnesite
This heat was tapped with
7/1697 to assist in making
Ingot mold for A. P. Ingot
Made 2 Carbon Tests.
Cast 30-13" sq. N.S. moulds full
Excess metal 2500 lbs
Metal Hot

Pit Boss - McNamara



PARTICULARS OF HEAT.

Total Amount of Material Charged, 85564

PRODUCED

Good Ingots, 20440
Castings, 53900
Scrap. 74340
Scrap. 780.1

Ingots No. Ingot to No. 30

Total Amount of Metal Produced, 82141

Loss, 3423

Carbonized by J Walsh  Tensile Strength aimed at  Bonus, $  Docked, $ 75

C. det in
" " "
" " "
" " " check standard,
" " " test Bar,

| | | | | |
|---|---|---|---|---|
| Phosphorus, Estimated, | .03 | On Charge, | On Castings, | |
| Manganese, " | .32 | " " | " " | |
| Silicon, " | .15 | " " | Ni 3.50 " | " |
| Sulphur, " | | " " | Cr 1.50 " | " |

PHYSICAL TESTS

| DESCRIPTION | Tensile strength lbs. per square in. | Elastic limit lbs. per square in. | % of extension after fracture | % of contraction of area after fracture |
|---|---|---|---|---|

ANALYSES

| Anal. No. | | |
|---|---|---|
| Drilled from | | Dust |
| C., | .276 | 0 |
| P., | .018 | .023 |
| Mn., | .107 | .100 |
| Si., | .122 | TR |
| S., | .017 | |
| Cu., | .064 | |
| Ni., | 3.37 | |
| Cr. | .99 | |

DROP TESTS

FIG. 1—Copy of the original record of a heat made in 1905 to assist another heat in pouring the sinkhead of an armor plate ingot. The handwriting is that of F. B. Foley, ASM president, who was employed in the Midvale Co. laboratory at that time.

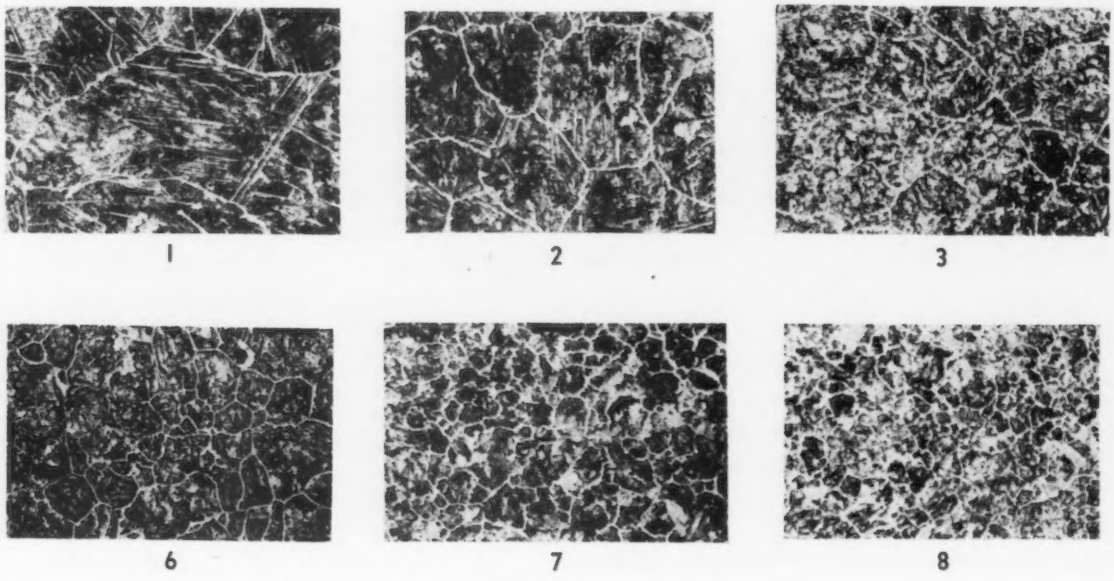
steel specifications for auto construction. These steels were as follows:

**Spec. No. 1 . . . 0.45 pct C Chrome Nickel Steel**
**Spec. No. 2 . . . 0.25 pct C Chrome Nickel Steel**
**Spec. No. 3 . . . Nickel Steel (0.30 pct carbon)**
**Spec. No. 4 . . . Carbon Steel (0.50 pct carbon)**
**Spec. No. 5 . . . Low Carbon Steel**
**Spec. No. 6 . . . Spring Steel**

Concerning these specifications, Souther had this to say. "Little bessemer steel finds its way into the automobile industry. As found in this country it is of impure quality, suitable for only the lowest grade of work. Bessemer steel is found commonly in screw stock, which is very poor material. Its only redeeming feature is that it machines easily. It is weak and brittle and not fit for any important part of an automobile." Even at this early stage, however, Souther realized a feature that is oftentimes overlooked even today and that is that the modulus of elasticity of steels is substantially the same. As he pointed out, a crankshaft that has been found to be too weak, that is not stiff enough, cannot be strengthened by substituting a very strong alloy steel (of the same dimensions) for a low carbon steel. He explained that, although the crankshaft would bend or deflect the same under identical loads, nevertheless an alloy steel crankshaft would stand more such bendings before rupture than a carbon steel shaft.

When Henry Ford won his lawsuit in 1909, the Seldon patent was declared invalid and the mechanical branch of the ALAM was disbanded. The engineers making up that unit joined the Society of Automotive Engineers, then an infant social organization, and converted it into a strictly engineering organization. The steel specifications and notes carried over from the ALAM were first discussed by SAE in January 1910. Soon after this the SAE standards committee was appointed. The first report of the iron and steel division was accepted by the society in January 1911 in spite of the misunderstanding that

First Grain Size Chart




developed between the steelmakers and the steel users over the matter of specifications. The question arose as to whether the steelmaker should be held not only to chemical composition but also physical properties. Souther took the viewpoint that it was not fair to specify both chemically and physically. He expressed it as "tying a man hand and foot and asking him to run." This discrepancy carried over into the second meeting of the iron and steel division of SAE and after a rather lively session, the group decided not to attempt to modify the specifications at this time to incorporate physical properties.

In 1912 the third report of the iron and steel division included a numeral index system that had been adopted in the numbering of the metal specifications. This system was said to render possible the use of specification numerals on shop drawings and blueprints descriptive of the quality of material covered by such numbers.

It would be of interest at this point to relate some early experiences in the manufacture of automotive steel. Fig. 1 is a copy of the original record of a heat made to assist another heat in pouring the "tonghold" (sinkhead) of an armor plate ingot. The handwriting in fig. 1 is that of ASM president F. B. Foley who started work at Midvale Co. back in December 1905. Mr. Foley points to the fact that most of the nickel in the original charge was added as nickel oxide. At that time metallic nickel was new and not readily obtainable and was used only to bring the heat to the proper nickel content after it had been analyzed for nickel.

An interesting feature of fig. 1 is the "dock and bonus" system in use at that time. The melter in the particular heat shown lost 75¢ to $1 for missing the manganese (0.107 pct was desired and he obtained 0.32) and 25¢ bonus was paid him for getting 0.122 pct Si when 0.15 was desired. In every case Class II analysis was aimed at and this applied to OHAP (openhearth armor plate) and Midvale special auto steel. If the chromium came low, as it frequently did, the heat was passed for Class I and if it came high it was Class II.

In 1906 the first heat of chromium vanadium alloy steel was made at Homestead Steel Co. It was not a complete success and in August of that year a second heat was made by the United Steel Co., Canton, Ohio, on the order of Ford Motor Co. C. H. Wills and John Wandersee of Ford were present, as well as the elder Timken, and Kent Smith of Vanadium Corp. (later with Climax Molybdenum). The steel was heat treated and used for front wheel spindles, axles, shafts, gears, springs, etc. Both caustic and oil quench were used. This is claimed to be the first heat treatment of automobile constructional alloy steels. [Kent-Smith referred to vanadium in steel as "comparable to strychnine in medicine. A little is a splendid tonic. If you give too much you kill your patient. If I use ordinary case hardened steel containing 0.02 or 0.04 Va, I do not think I will get as good a result as by using 0.15 or even up to 0.20 Va."] Through the persistance of F. J. Griffiths, dean of constructional alloy steelmakers, a satisfactory openhearth chromium-vanadium steel was made but only after several unsuccessful attempts. Ford Motor

Based on McQuaid-Ehn Test

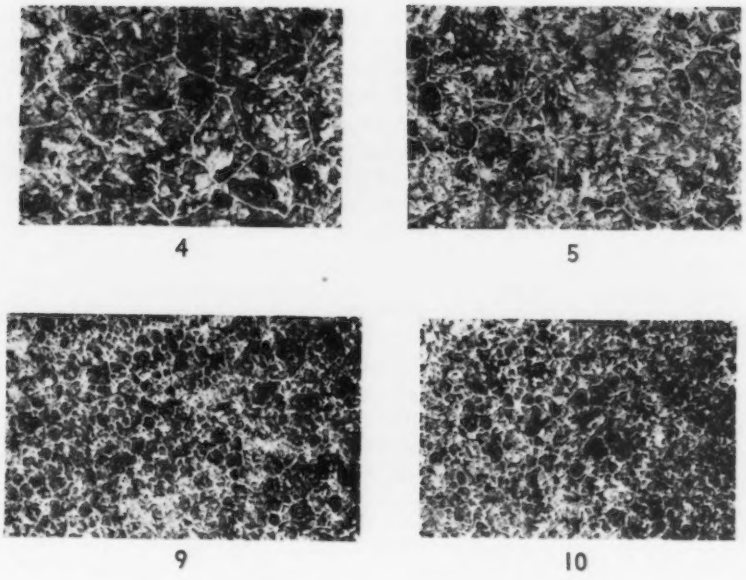



FIG. 2—First published austenitic grain size chart. This chart was issued in 1924 by United Alloy, now a unit of Republic Steel Corp. This chart is reproduced through the courtesy of Republic Steel Corp.

adopted this grade and saved considerable weight and improved design through the use of the higher strength material.

Manganese-silicon spring steels very close in chemistry to the present day 9200 series were adopted for use in this country about 1910. The French were instrumental in developing this particular grade. Simultaneously, small electric arc furnaces were added to the crucible method of making commercial alloy steels here.

At about this time 3½ pct Ni gears and other parts were applied by some of the automotive makers. Peerless Car Co. in Cleveland was one of the early users, as was the Overland Car Co. in Toledo. The old Overland allegedly had carbon steel gears in the transmissions and differentials, up to about 1913. In that year transmission and differential gears were changed to alloy containing 3½ pct Ni. The upper New York State area, Syracuse and Elmira, N. Y., was then the gear center of the country. New Process Gear Co. in Syracuse, plus a transmission producing company in Elmira, N. Y., whose name seems to have escaped everybody, were the principal makers. The first high production of transmissions employing alloy gears came out of Elmira, N. Y. The best evidence indicates these gears were carbon-chromium type similar to the 5100 series today, and that the steel was made by the United Alloy Steel Corp. of Canton, Ohio. Shortly after this period, the New York State area broke up as a gear center, one segment moved west and later became Warner Gear Co.

Simultaneously other automobile parts for Ford, Pope Hartford and Pierce-Arrow were being made of chromium-nickel and nickel steels plus some amounts of chromium-vanadium steels. Chromium-vanadium steels happen to be an American development in constructional alloys.

About 1913 a metallurgist named Miller was assigned by Pierce-Arrow to the Midvale laboratory to develop a specification under which Pierce-Arrow could purchase rear axles from Midvale. To measure the toughness characteristics of the nickel-chrome steel that had been settled on by the automobile maker, Miller used a hammer and vise setup. An impact machine (later known as Izod) was constructed at the Midvale laboratory about this time, under the direction of the late Radclyffe (Mike) Furness. It had a 36 ft-lb capacity and the specimen was ⅜ in. wide, 3/16 in. thick with a 90 V-Notch 3/32 in. deep across the ⅜ in. face.

Miller adapted this machine and soon found a range of impact values that should be obtained in axles properly treated to meet the desired tensile properties, and a specification was soon prepared. The specification called for 15 ft-lb impact value, but when work got under way it was discovered that the steel involved possessed the required tensile properties, but the impact values were all under 8 ft-lb. Every precaution was taken regarding temperatures for normalizing and drawing, and even though the heat treating furnaces were equipped with Leeds and Northrup recording potentiometers—the first installation of its kind in the country (if not in the world)—the impact values could not be improved by more than 1 ft-lb.

Experience in "fibring" armor plate had indi-

cated that a plate which showed poor fibre could be made to fibre thoroughly if it were quenched in water from the drawing temperature instead of cooling in air. This proved to be the answer and without affecting tensile properties, quenching the axles from the drawing temperature more than doubled the impact value. The Pierce-Arrow axles were put in service in the "quenched condition," a fact which Midvale technicians were loathe to reveal for fear the axles might be rejected. And so the first experience with "Krupp Krankheit" or "temper brittleness" was buried in the files with much hush-hush.

Shortly thereafter S. C. McCleary, chief metallurgist of the Dodge Motor Car Co., adopted chromium-vanadium steel for gears and chromium-nickel steels of the 3200 type for other parts. This high production of chromium-vanadium steels was the first departure from the trend of nickel or chromium-nickel steels. Although many experts of that day predicted that chromium-vanadium steels would not work, the application was very successful at both Ford and Dodge Motor Car Co.

During the alloy substitution program for carbon steel gears in the Overland car, just prior to World War I, considerable trouble had been experienced with carbon steel steering knuckles. Some of these knuckles were swung over to a 3100 type of alloy and the report is that this cured the trouble with that particular part. At the same time the steering knuckle ball stud, which was made of case-hardened carbon steel, was investigated. This part had the disgusting habit of breaking much too often. Alloy steels were considered for the job but after considerable research the metallurgists in charge of the Overland plant decided they could get by with a case-hardened carbon steel if a softer core was obtained. With this type of heat treatment their trouble on ball studs disappeared.

During the first World War many new uses were found for alloy steels and the production was further expanded by using the openhearth process. Central Steel Co., Massillon, Ohio, brought their carbon-chromium (Uma) steels in at this time. These steels today are known as the 5100 series and were used by Ford Motor and other companies.

It is apparent that the automotive makers pioneered practically all applications of the early alloy constructional steels. From 1914 to 1920 such companies as Buick, Studebaker, Maxwell, Oldsmobile, Chevrolet, Marmon, and others, continued the use of chromium-nickel and nickel steels. In 1922 the Wills St. Clair automobile started to advertise the use of chromium-molybdenum steels in promoting the sale of the car. These steels were developed through the efforts of H. C. Wills and are very similar to the present 4100 series.

The first excitement over grain size started about this time. During the first ASM convention held in Detroit in 1921, Ehn gave a paper on a carburizing grain size test. Considerable trouble in the form of softs had been experienced by the trade with carburized carbon steel bearings reported to have been made by Timken. Ehn's paper brought out for the first time definitions of normal and abnormal grain size as well as a method of checking. Ehn later teamed up with McQuaid and from their joint efforts emerged the now recognized McQuaid-Ehn carburizing grain size test, see fig. 2. In 1925, R. B. Schenck, chief metallurgist of the Buick Motor Car Co., developed the carbon-manganese series of steels which are the present day 1300 series. These steels were used in steering knuckles and arms for Buick cars and in later years this grade was also used for gears, axle shafts, etc.

One of the most popular present day alloy steels, particularly carburizing steels for gear use, was developed some time between 1925 and 1930. As with many initial discoveries, this chemistry was developed accidentally when somebody used molybdenum-bearing scrap when making a nickel steel heat. Fortunately for the Studebaker Corp. this occurred in steel being produced for them. W. Woodside, then with Studebaker, followed this up and the steel was later adopted by them for gear applications. For many years the steel companies paid royalties to Studebaker Corp. for the melting of this chemistry and the alertness and curiosity shown by Studebaker paid off.

By this time the type of alloy steels began to mushroom tremendously. Harold Spears, then chief metallurgist of Chevrolet, had adopted a 6100 steel (chromium-vanadium) for gears and nickel and chromium-nickel steel for other parts. On top of this they were investigating the possibilities of a 3½ pct Ni, 0.20 to 0.30 pct Mo steel for differential gears, which is the present 4800 series. This steel was developed and adopted by E. O. Mann who followed Spears as chief metallurgist of Chevrolet. By 1930 the nickel-molybdenum steels had practically displaced the more expensive chromium-vanadium, nickel and chromium-nickel steels and the single alloy 3½ pct Ni gear steels throughout the entire automotive industry.

Many of the specifications were considered proprietary by different companies at this time. The need for standardization of alloy types was realized back in this period but little concerted effort was made by either user or producer to do anything about it. Early in the thirties, F. E. McCleary, chief metallurgist of Dodge, had perfected a chromium-nickel-vanadium carburizing steel, used for differential gears, which was later discontinued in preference to a nickel-molybdenum type. In 1933 Chrysler Dodge Motor Car Co., through the efforts of H. C. Wills, who held the patent, and F. E. McCleary the carbon-molybdenum steels (now known as Amola) were adopted for use in many automobile parts.

During the thirties, Nitralloy, a French development of a chromium-molybdenum-aluminum steel particularly suited to absorb nitrogen and thereby provide a hard wear resistant case, was brought to this country for use in such parts as cylinder barrels for aircraft motors, pump shafts, camshafts, etc. About the same time the chromium-nickel-molybdenum constructional alloy steels of both the 0.40 C and 0.20 C type, which are today the 4300 series, were introduced by Timken Detroit Axle Co. through Harry McQuaid, chief metallurgist, and S. L. Widridge,

(CONTINUED ON PAGE 266)

# New Production Ideas . . .

*For further information on any of the following items, check item number on card facing page* 158 *and drop card into mail.*

***Heat treating units, tap grinders, a creep testing machine, a wire take-up machine, hydraulic presses, openhearth door frames, mill motors, an automatic parts washer, a cable cutter, a dust collector, conveyer belts, alumina powders, and various small tools and attachments are new and improved products featured this week.***

### High Frequency Heating Units

1 ALL-STEEL construction of frame, base, and panels are features of the redesigned high-frequency heating units announced by *Lepel High Frequency Laboratories, Inc.* Unit interiors are of the latest fire-resisting materials, and operating controls are arranged for greater convenience. Other changes include improvements in the spark gap holders, and the use of fiber glass insulation in the high-voltage side of the main transformer. The units, available in 7½, 15, and 30 kw ratings, are applicable for high-frequency heating on ferrous or nonferrous materials. These units,

without any auxiliary equipment, can be used for hardening, annealing, stress relieving, brazing, soldering and melting.

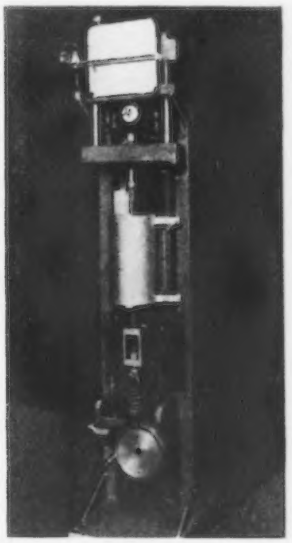
### Tap Grinder

2 A NEW line of tap grinders with capacities from No. 6 to 3-in. taps, grind taps that will cut clean, sharp accurate threads in tapped holes with less than half the power required for hand ground taps, it is claimed. All kinds of taps and types of threads may be ground and a special attachment for bent shank taps is available. The double end spindle type machines

grind any desired angle of entrance taper with all flutes ground the same to permit each land to do an equal amount of cutting. The spindle is driven through V belts from the 1½ hp motor mounted in the base of the machine. *Gallmeyer & Livingston Co.*

### Creep Testing Machine

3 A NEW motor-driven, screw-type creep testing machine of 20,000 lb capacity has been designed by *Baldwin Locomotive Works* for short-time, creep-rupture test at high temperatures, with a minimum of operator attention. The machine automatically maintains constant loads up to 100,000 psi on standard 0.505-in. diam specimens while temperatures are held constant up to 2200°F. Tests of this type may run for 10 to 400 hr. A feature of the machine is a flat 10x10 in. chart recorder panel in front, with which no extensometer is required and no strain readings need be made. The elongation against time curve is automatically and accurately drawn on the chart from the start of the test until rupture occurs. Elongation can also be read directly in thousandths. The specimen is loaded below through

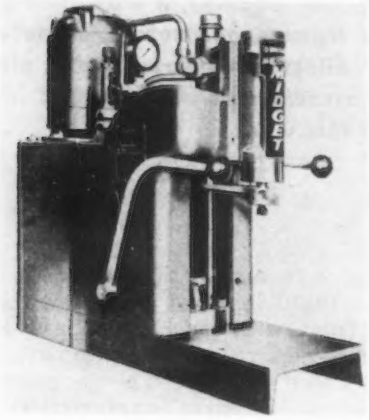


gearing. Deflection of a spring block, which supports the specimen, is measured by a dial gage with an electrical contact that controls the motor that drives the screw. Thus, constant deflection is maintained in the spring block and constant load is applied to the specimen. The machine can be adapted to short-time tensile tests, constant strain-rate tests, or relaxation tests.

### Packaged Multipress

4 THE Midget multipress, manufactured by *Denison Engineering Co.*, offers in a packaged

unit, a multi-purpose, oil-hydraulic press of 2000 lb capacity with its own pumping equipment. Ram stroke, speed, and pressure are all regulated by controls at the operator's fingertips. The press can be



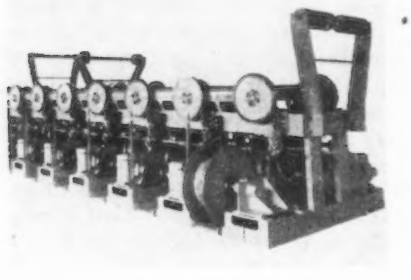
adapted to other hydraulic machinery as an accessory unit, and may be operated in any position. Ram stroke is 6 in.; throat depth, 4⅝ in.; daylight opening up to 15⅜ in.; ram speed, 600 ipm up and 400 ipm down.

### Diamond Setter

**5** THE Qualiset diamond setter, for making diamond tools, has been announced by *K-E Industries*. The machine operates on 110 ac circuit, and is capable of setting a diamond in less than 2 min, it is reported. Anyone can learn to operate the machine.

### Wire Take-Up Machine

**6** FOR use in plating steel wire, a new take-up machine has been designed by *Black Industries*, accommodating 36 reels. Each reel



has an individual control for maintaining constant tension as the wire builds up on the reel. No slip clutches or riders on the wire are used; constant tension is held through the individual motors. Controls are simple, sturdy and the machine is driven by ac. The design may be modified to meet various requirements in single units, multiple reel or block-type frames.

### Vacuum Pump

**7** AN improved rotating plunger-type vacuum pump for general industrial use has been announced by *Rite-Way Products Co.* Compact and streamlined, the unit develops 28½ in. of vacuum. With 15 in. of vacuum and speed of 1700 rpm, the pump capacity is rated at 4½ cu ft of free air per min. The unit features a built-in muffler and a new, sealed-in lubricating system.

### Variable Speed Transmission

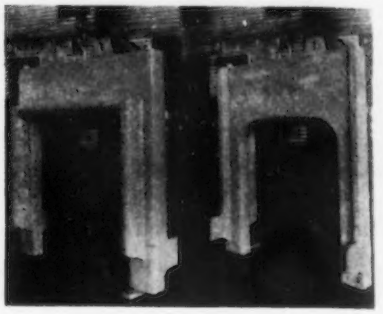
**8** INFINITELY variable speeds of wide range are provided by a new transmission designed by *Speed Control Corp.* The unit consists of a mechanical differential attached to a standard link belt PIV unit. Four models are offered, providing any desired speed, forward or reverse, between 0 and 7000 rpm. Output torque from 20 to 15,460 in.-lb is also available. Net output horsepower varies from 1 to 20 in different models and speeds. Desired speed is set by a hand wheel and indicated on a large dial. Specon MD transmissions are suited to many continuous industrial processes requiring accurate speed control at one or more points.

### Pump Packing

**9** RAMIE packing which is recommended for uses such as cold water and brine pumps because of its high tensile strength and ability to absorb and retain lubricants, minimize abrasion and prolong wear is now offered by *U. S. Rubber Co.* It is available in square plaited form, coil form and in sizes of ¼-in. and larger, and its toughness is said to make it suitable for packing applications where service requirements are too severe for flax or jute fibers. This packing is also said to be highly resistant to fresh or salt water, brine or cold oil and tensile strength is unaffected by moisture.

### Openhearth Door Frame

**10** A NEW type openhearth door frame, developed by *Blaw Knox Div.*, provides durable service under difficult charging conditions. The frame is a patented archless type with arch and jamb cooling.



The all-welded frame eliminates brick arches around the doors of the furnace. Water cooling on the back of the frame, left, protects the skewback member and the jamb cooling protects the side-walls of door opening. This frame permits maximum opening, both in width and height, for furnace charging.

### Hydraulic Press and Timer

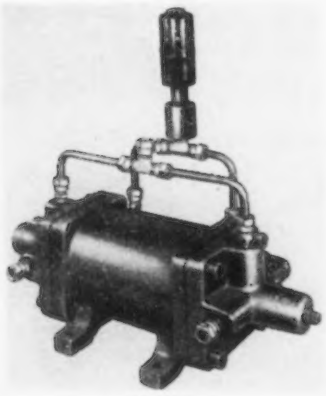
**11** VARIATION of both daylight and column spacing from standard specifications with a minimum amount of engineering and machining is a feature of a


two-column hydraulic press manufactured by *Hufford Machine Works, Inc.* Available in capacities from 10 to 200 tons, the press can

be converted to a wide range of operations in metal, plastics, chemical and powder compact industries. The standard model is equipped for manual operation, but can be converted to semi-automatic or full automatic operation. Either single or multiple ram action is possible for opposed pressing, ejection, die charging, and off-bearing. Automatic timing is produced in any desired sequence of operations by means of the company's mechanical timer that produces a series of perfectly timed repetitive motions to multiple ram installations utilizing hydraulic cylinders.

### Pressure Intensifier

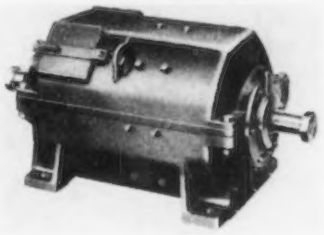
12 SMALL hydraulic press operation has been improved by the installation of an air-actuated continuously charging intensifier on all Hydrolairs, manufactured by *Elmes Engineering Works*. The



unit, called the Power-Petuator, provides a continuous high pressure stroke, and maintains any desired pre-set ram pressure, even on compressible materials. Working pressure is built-up virtually instantaneously when press controls are in press position. The Power-Petuator is a self-contained unit, placed at the rear of the bench type presses and in the base of the floor models. Ram pressure is set by means of an air pressure regulating valve. Power is taken entirely from the shop air line.

### Mill Motor

13 THE new mill motor, added to the line of dc steel mill motors manufactured by *Crocker-Wheeler Electric Mfg. Co.*, is adaptable for use totally-enclosed non-ventilated or separately ventilated. For self-ventilation, machines are cooled by a fan mounted at the rear of the armature. In the non-ven-



tilated motors, the fan action is provided by the back ends of the coil supports. Shortened bearing housings, proportioning of field pole design, the use of modern design and materials convert inactive space and weight into greater driving power. Special grease slingers and grooves keep grease and dust away from commutator and windings. Improved commutation is provided by split brushes and four interpoles.

### Automatic Parts Washer

14 A PORTABLE automatic parts washer, introduced by *Protectoseal Co.*, is compact and offers complete fire protection in

the use of flammable cleansing solvents. Washing of parts is achieved by moving the perforated basket, with contents, up and down through the solvent. The machine is engineered to produce least possible turbulence and therefore permits greatest flow of liquids over the parts. Parts move through the liquid, not with it. A reciprocating air engine provides the power. The Air-Matic will operate on any compressed air supply.

### Soft Solder

15 AN indium-lead alloy, that contains no tin, and has a melting point of 600°F, has been introduced by *Soldering Specialties*. It exhibits an extremely short plastic range, and has a holding strength of 3500 psi and a tensile strength of 5200 lb, with a high degree of ductility. This No. 50 solder alloy is available in all standard wire gages, in ribbon form, and in preformed shapes such as rings, washers, pellets, and disks.

### Broach Handling Unit

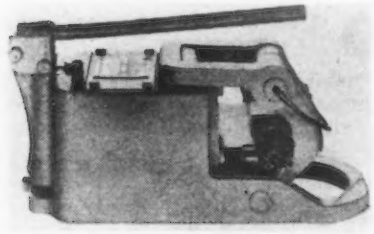
16 A UNIVERSAL horizontal broaching machine that incorporates an automatic broach handling mechanism and a parts ejec-

tor conveyer interlocked with the machine cycle, has been announced by *Colonial Broach Co.* The broach handling mechanism eliminates handling of the broach by the operator, who merely places the parts to be broached over the pilot ends of the broaches. The broaches then carry the parts with them into the broaching position against the face plates and broach pullers automatically pull the broaches through the parts. The finished parts drop off the ends of the broaches onto the conveyer.

### Cable Cutter

17 CABLE cutting in any position with a 70-lb wire rope cutter with maximum capacity of 1½-in. rope is announced by *Peli Cable Cutter Co.* Of steel construc-

tion, this Model LC Hydrashear is manually operated, self-contained and is said not to require anchorage when used. Wire rope is cut by several short strokes on the pump



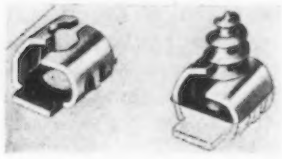
handle which causes hydraulic pressure to effect the cut. Construction of blade and die are said to prevent flattening or deformation of rope. The blade does not require adjustment.

### Belt Idler

18 A NEW type belt idler featuring lubricated-for-life ball bearings has been announced by *Palmer-Bee Co.* The idler rolls are identical for each width of belt. They are easily removable by hand and completely interchangeable.

### Snap Nut

19 THE new spring steel snap nut, announced by *Prestole Corp.* anchors nut-to-panel for blind attachments. No welding, riveting, clinching or special tools are necessary. The nut is simply pressed



into assembly position, and is attached directly from the work surface, instead of reverse side of panel. It snaps into a 9/32 in. square hole in panels 0.037 to 0.055 in. thick, and is designed for easy entrance of the screw, even in cases of misalignment of panels. As the screw is driven, the arched spring arms of the nut expand just enough to permit entry of the screw, locking the fastener to the inner panel, and at the same time binding against the root of the screw thread. This fastener will accommodate No. 8 and No. 10 sheet metal screws. It will stand a tightening torque of 35 to 45 in-lb.

### Dust Collector

20 COLLECTING dust from small wheel grinding and sanding and lint from buffing and polishing operations is facilitated with a portable self-contained dust collector announced by *Aget-Detroit*

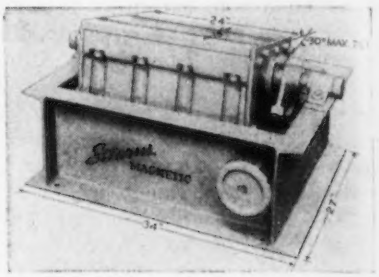
*Co.* A rating of 320 cfm at 1½ in. water lift on 3 in. inlet is developed by a continuous duty, 3600 rpm, 1/3 hp motor, direct driving a self-clearing paddle wheel fan. A series of baffles separates the lint, chips, wire and heavier dusts. A filter of non-inflammable spun glass forms the top of the dust collector and provides a second stage cleaning of the air before it is returned to the working space. Inlet connections are single 3, 4, and 5-in., and double 3 in.

### High-Tension Conveyer Belt

21 FOR jobs where belt tensions run as high as 1000 lb per in. of width, a new high-tension fabric conveyer belt called Raynile, has been announced by *Hewitt Rubber Div., Hewitt-Robins Inc.* The strength material consists of a combination of rayon and nylon. Important features include maximum tensions; excellent transverse flexibility; minimum stretch in actual operation; and field splicing made easy because of fabric construction. Reinforcement of Raynile fabric belts is accomplished by use of plies of rayon and nylon fabric suitably bonded to each other.

### Tilting Frames

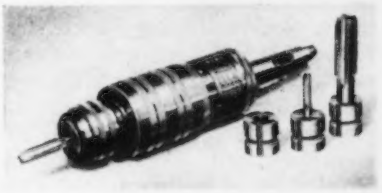
22 AS AUXILIARY equipment for grinder holding-magnets that grip castings and other material and save time in preparing jigs



and clamping devices, a tilting frame has been announced by *Stearns Magnetic Mfg. Co.* The tilting frames allow for positioning work in a 30° arc and accommodates 16x14 in., 16x24 in., and 16x40 in. grinder holding-magnets. Magnets can be energized or de-energized by hand or foot switches from dc voltage wound to suit requirements.

### Tapping Attachment

23 ELIMINATION of tap breakage is claimed for a new tapping attachment designed by *Wickman Mfg. Co.* This attachment, known as the Jay-Dee, guarantees tap safety, offers greater range, operational simplicity, and low maintenance. Jay-Dee employs a resilient material that delivers a safe cutting torque and protects

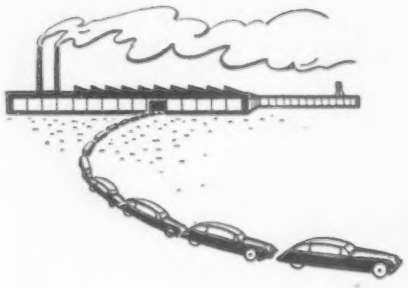


taps regardless of load. The attachment can be used with all types of reversible machines, for horizontal or vertical tapping, for blind or through holes. It is suitable for stud driving and for standard hand taps. Four index stations, listed according to tap size on the body of the attachment, can be selected. Tap changing takes 5 sec; no wrenches are required. Three models are available: 16½ in. long with a ½

# Assembly Line . . .

WALTER G. PATTON

**• Jeep family grows at surprising rate . . . Stress analysts enter automotive field . . . New emphasis placed on supervisory employees' place in management.**



DETROIT—For the third consecutive year Willys-Overland staged its annual Institution Day this week. The occasion brought more than 700 industrialists, bankers, educators and members of the press to Toledo to see what the Jeep and its descendants are up to.

The guests who enjoyed Willys' hospitality this week could hardly fail to observe that the Jeep family is growing at a surprising rate. The direct descendants of the Army Jeep now include, in addition to the universal Jeep, the Jeep station wagon—both four and six cylinder jobs, a station wagon with four-wheel drive, a new utility wagon (with overdrive and rear passenger seats eliminated), a Jeep panel delivery truck and two and four-wheel drive trucks. The newest creation and the darling of the line is, of course, the new Jeepster which has the Willys sales staff looking mighty pleased with themselves these days.

Among the vehicles that attracted special attention in the parade of some 50 Willys products were a new 10-passenger Jeep bus, a bright red fire truck, an Army version of the Jeep that operates under extremely heavy conditions and another Jeep that operates under 5 ft of water with the engine completely submerged.

Willys continues to exploit what can best be described as the forgotten fields of transportation. While it has a passenger car on the drawing boards it is a justifiable conclusion that with materials running short and costs running high Willys has no present ambitions to lock itself in direct competition with the Big Three in the passenger car field. The company is continuing to build cars and trucks that use less steel per unit than any of its competitors. Willys' present and projected program probably has greater interchangeability of parts than any other producer.

The company has no hesitation in claiming it gets more work out of a set of tools than any of its competitors. Other Willys claims to distinction include extreme simplicity in styling, planned accessibility for repairs, excellent fuel economy, adequate road clearance and ability to operate successfully under off-the-highway conditions.

Willys earnings picture is highly favorable. Last year's net reached the highest level since 1926 totaling $6 million. This is just about double the 1947 earnings. Currently about 20 pct of sales are in foreign markets, with South America taking the largest share.

Total Willys production during the fiscal year ended September 1948 was 136,000 units. Sales aggregated $175 million.

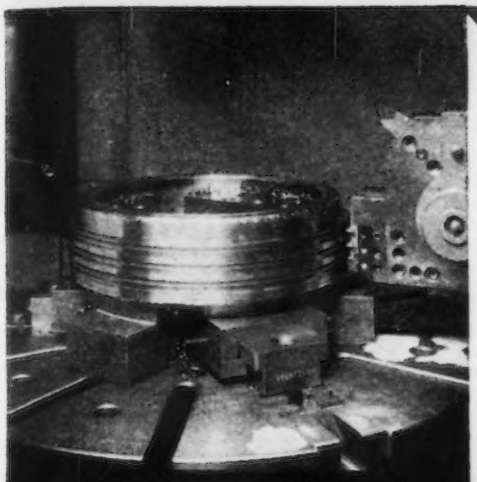
Willys present plant capacity is rated at 300,000 units. The 1948 goal has been set at 200,000—if the steel is available. It is a well known fact that Willys has had to lean heavily on its conversion steel sources. The success of the present program may be judged from the fact that total steel receipts in 1948 were about double the 1947 total although a considerable amount of this steel is undoubtedly used for Willys army contracts.

WILLYS forge shop with a capacity of 80 million lb per year is currently operating about 45 pct of capacity, up from a low of 20 pct. There is some possibility that Willys may start forging aluminum again, in addition to the substantial volume of outside contract work in its shops.

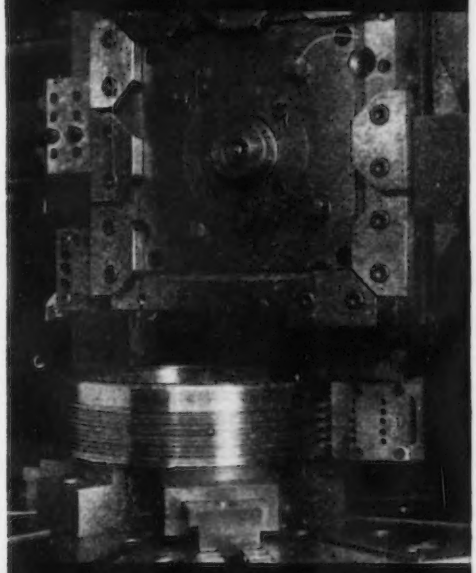
In order to encourage good housekeeping Willys has been running a novel contest in which three of the company's products are to be given away to the department showing the most improvement in housekeeping. As a reward for a particularly outstanding job, an additional vehicle was made available to the forging department. Individual winners of the vehicles will be determined by a drawing.

Willys engineers have recently introduced quality control methods into the forge shop with excellent results. On one item—the counterweight for a crankshaft—estimated annual savings of $49,858 have been realized. It is estimated that almost half of the saving was realized from steel savings alone; the remainder is attributed to improved die life and decreased labor costs on dies and a saving in automotive labor and tools. According to Willys engineers, the quality control program has been well received in the shop and plans are now being made to extend it to all forged production parts now in the forge shop.

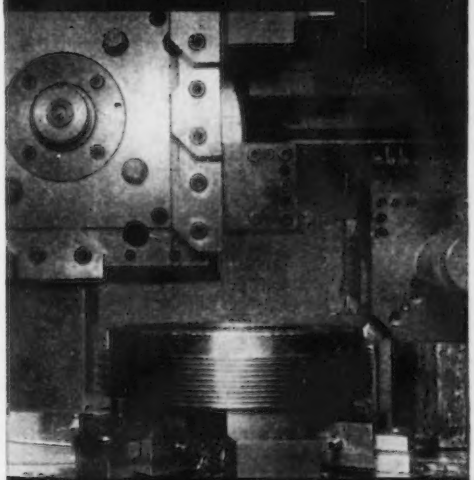
An unusual feature of the recent Institution Day visit was a display of projected Willys-Overland models, including up-to-date versions of the present station wagon,, passenger car and other products. Since most of these new models may be as much as 2 years away even after the design is frozen, it is conceivable that many changes will be made before these models actually



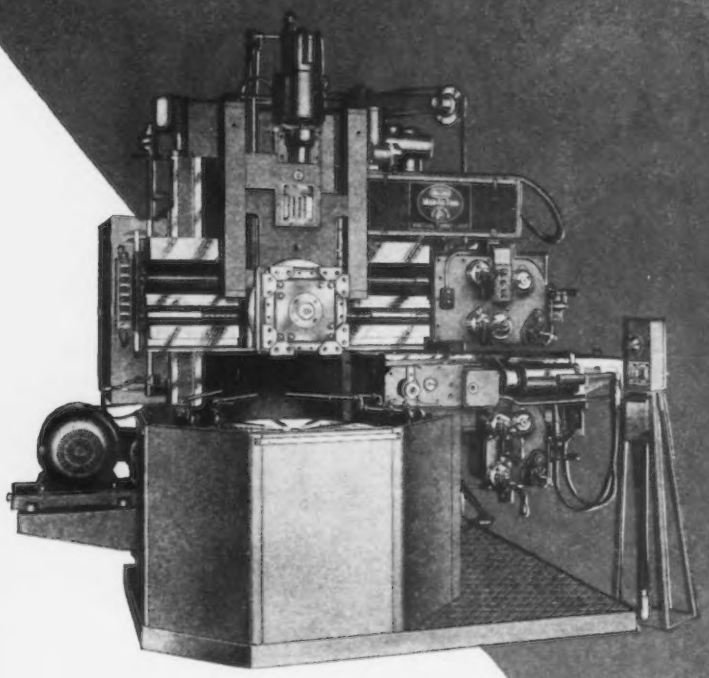
This is the first finning operation—finish turn OD of fins and semi-finish turn shoulder diameter—face flange and form shoulder radius and rough cut fins.



Here Man-Au-Trol utilizes the angular turning attachment to generate the top surfaces of the fins. 5 cutting tools instead of 3 are working simultaneously as in the roughing operation.



This is the final finning operation—the under surfaces of the fins are generated using 5 cutters in the turret head, while side head turns the shoulder.



BULLARD 30" Man-Au-Trol Vertical Turret Lathe versatility solved a brake drum problem for Copperweld Steel Company Brake Drum Division. It reduced the machining time for their delicate finning operation from 80 minutes per drum for the only previously successful method to 18 minutes per drum. The Man-Au-Trol method not only successfully provided a finning method, but also took additional cuts not previously possible without additional set-ups.

Several of the Man-Au-Trol functions are pictured and described on the accompanying close-ups.

# BULLARD MAN-AU-TROL PRODUCES UNIQUE Copperweld BRAKE DRUMS MORE THAN 4½ TIMES FASTER

You, too, can set new production records with BULLARD Man-Au-Trol Vertical Turret Lathes. No other machine combines productivity, versatility and accuracy on such a lavish scale. Bulletin MAV-G-1 proves it. Write for your copy today. THE BULLARD COMPANY, Bridgeport 2, Connecticut.

BULLARD
MAN-AU-TROL
MASTER OF THE MACHINE

reach the public. It was disclosed that Willys has definitely planned for changes in its motor that will enable it to keep pace at least with the earlier stages of the present trend in the direction of high compression motors and greater economy. What it has up its ample sleeve and beyond this was not disclosed.

## GM Family Adds New Man

*Detroit*

• • • **For the second time** in recent months General Motors has gone outside its own ranks to pick a top member of its executive staff. Last week, C. E. Wilson, president of General Motors, announced the appointment of Wilbur H. Norton to the staff of the corporation. Mr. Norton will work on special assignments reporting directly to Mr. Wilson. He was formerly president of Montgomery Ward & Co. Earlier he was associated with W. T. Grant Co. chain store.

It will be recalled that earlier this year Roger M. Keyes, former president of Harry M. Ferguson, Inc. joined the executive staff of General Motors as special assistant to Mr. Wilson. Recently, Mr. Keyes was placed in charge of scheduling and procurements for the corporation. Detroit sources will be watching with interest to see what niche Mr. Norton is eventually fitted into in the GM family.

## Dealers Serviced By Air

*Toledo*

• • • **Barring empty** stock bins, the day when the car owner has to wait for days—or even weeks—for a spare part are definitely at an end. Recently, several automobile producers have begun to make extensive use of air freight and air mail to service their dealers.

Willys-Overland, for example, is keeping its 4000 dealers and distributors stocked with replacement and service parts through liberal use of air transport.

Parts in short supply are being distributed by air where the need is urgent and the dealer is unable to supply the parts. A special emergency order blank is used for the purpose. Such orders are given immediate attention when they arrive at the Toledo plant, according to Willys-Overland executives.

## Stress Importance Of Supervisory Employees In the Auto Industry

*Detroit*

• • • **Efforts to convince** supervisory employees of their importance in management have taken many forms in the auto industry. The latest plan to be approved is Packard's liberalized policy toward its 750 members of supervision in the factory and in the field.

Under the new policy, approximately 550 persons out of 750 members of supervision will stop punching clocks. All supervisors with a minimum of 1 year service will receive 3 weeks' vacation. Small, attractive identification cards are being substituted for the old badges. The employees will be called upon to work overtime only on exigencies demand or on approval by a company officer. The new plan will be effective not later than Oct. 24.

George T. Christopher, president and general manager, explained that the program was adopted after months of careful discussion. The Packard management team is now classified into four groups: (1) Administrative executives; (2) executives; (3) supervisors; and (4) staff. Staff members are defined as "professionals and specialists who report to executives but whose work is on a par with that of the supervisors." The first three classifications include department heads and other members of the staff having supervisory responsibility.

About a year ago Mr. Christopher began an interesting experiment in his effort to strengthen the Packard management team. Packard top management was divided into a Senior and a Junior management committee. The Junior group is represented by a 14 man committee whose members are elected by their fellow supervisors. From the group of 14, four are chosen to represent the Junior Committee on Packard's so-called Working Committee. This committee also has three members appointed by management. The Working Committee meets bimonthly and is relied upon to make recommendations to Packard's top management on matters of company policy.

In addition to its Working Committee, Packard is regularly holding "get-acquainted" outings at factory expense. These meetings are held quarterly under the direction of the representative's own committee. Last month more than 500 members of the Packard "management team" spent a day at the company's proving grounds near Utica, Mich.

While Packard is unwilling to predict that this is the answer to all its management problems, observers close to the company believe that Packard has taken a long forward step since the days of the now dissolved foremen's union. Most sources agree Packard's management is today about as democratic as any the automobile industry has come up with to date.

## Stress Analysts Gain Foothold in Auto Field

*Detroit*

• • • **The scientists** with medium-long hair are rapidly coming into their own in the automobile industry. The latest group of scientists to gain a foothold in the automobile industry are the experimental stress analysts.

Meeting in Detroit recently, members of the Society for Experimental Stress Analysis told of their present efforts to beat the "out-and-dry" system that auto engineers have been using for years to solve design problems.

Charles W. Gadd of General Motors Research Laboratories Div. told his fellow members about the present uses of wire strain gages, stress coat analyses and electronic counters which have enabled engineers to solve perplexing design problems in minimum time and with maximum accuracy.

The GM research engineer said that because of drastically higher internal loading of high compression engines, the whole basis of design of pistons, connecting rods and other members will have to be reexamined. He reported, that some of these parts are being stressed as much as 100 pct in excess of the same part of conventional automotive engines and must be designed accordingly.

"The better we can predict strength from laboratory stress analysis, the better job we will be able to do when asked to design a new product for which no background of service experience is available," Mr. Gadd told his listeners.


● In our world of tomorrow that soon will be today, beauty plays a new and leading role. For modern designers have found beauty has in it the essence of utility. Auto-Lite's great Bay Manufacturing Division reflects the importance of this new trend. Here under one roof are the technical skills and production capacity for a new art rendered in plastics including brilliantly colored elastomeric plastics, decorated metals and metal-plastic combinations. The artistic skill of Auto-Lite's Art and Style Division is available on matters of design and development.

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# Washington . . .

EUGENE J. HARDY

**• Subcommittee on questionable trade practices smacks many knuckles... Real results seen from the hearings . . . Report scrap gray market in flat-rolled is 10 to 12 pct.**

WASHINGTON — Administering sharp cracks across the knuckles of steel mill operators, end-users of steel, scrap dealers, government agencies and others it found contributing to the gray market in steel, the house subcommittee to investigate questionable trade practices today released its interim report calling for remedial action. While replete with recommendations as are most congressional reports, the report of this subcommittee, headed by Rep. W. Kingsland Macy, R., N. Y., does not lack concrete results for its painstaking 9-months effort.

Most important of these is an agreement with eight major steel producers to attempt to supply steel to manufacturers who cooperate in revealing their sources of gray market steel. In the language of the report this agreement is as follows: "Where a manufacturer can substantiate that he is purchasing steel at premium prices from a customer of one of the large mills, he stands a good chance of being able to make similar purchases at regular mill or warehouse prices providing he gives that information to this subcommittee or to the mill whose steel is involved."

The following companies have informed the committee staff that they would participate in this plan: U. S. Steel Corp., Bethlehem Steel Co., Republic Steel Corp., Jones & Laughlin Steel Corp., Inland Steel Co., National Steel Corp., Armco Co. and Youngstown Sheet & Tube Co. Hampered in its investigation by manufacturers who were afraid to reveal their gray market sources lest they be cut off from steel suppliers entirely, the committee staff proceeded to ask the major producers to carry one step farther their policy of cutting off customers found participating in the gray market.

The committee realizes that the mills may not be able to make such an agreement with every manufacturer who might purchase, at gray market prices, steel produced by that particular mill. However, the report states, "it should be possible for the mill to eliminate that gray marketeer and arrange for his manufacturing customers to obtain the steel at legitimate prices. If the mills would take such action in each authenticated case brought to their attention, it would constitute the most effective direct method short of controls, and far more expeditious, in eliminating the gray markets."

In addition, the committee estimates that, as a result of its investigations, at least 100,000 tons of sheet steel which would have been sold in the gray market has been made available to manufacturers at regular prices. The committee's staff concerned itself primarily with the major gray market items, principally sheet and strip, and also pipe and plate.

THE third concrete result represents one of the few legal weapons available to those fighting gray markets—Bureau of Internal Revenue cooperation in going after tax-delinquent gray marketeers. As a result of information supplied to the bureau by the committee substantial tax recoveries are being made. The committee has also been informed that many gray marketeers in order to correct previous tax statements have voluntarily filed supplemental returns and paid additional taxes.

During its 9 months' investigation the committee held only eight public hearings, all of which were thoroughly documented as a result of the committee's policy that a thorough and impartial investigation should be conducted prior to public hearing. However, approximately 130 investigations have been conducted in 31 states. As of Sept. 1, approximately 201 additional investigations were scheduled for the future.

Following a slightly different approach in arriving at an estimate of gray market steel, the committee estimates that 10 to 12 pct of the sheet and strip production has been sold at gray market prices, some directly from the producer, some from the warehouse, some after passing through the hands of brokers and manufacturers. The committee's approach differed in that rather than attempting to arrive at some percentage of total steel production, only the major gray market items were involved in this calculation, based on a given amount sold in the gray market.

Leading into its recommendations directed to the steel industry, the committee states that "based upon its investigations, that in spite of the rather general abuse leveled at the large steel producers of this country, they have, as a general overall proposition, achieved excellent results from the standpoint of production and distribution." Earlier in the report the committee points out that it found that "some mills are selling directly to manufacturers and brokers at gray market prices. Usually these are smaller captive mills which have been purchased within the last 3 years by syndicates, to take advantage of the high gray market steel prices."

THE committee then expresses the opinion that the generally good record of the industry could be improved by the adoption of the

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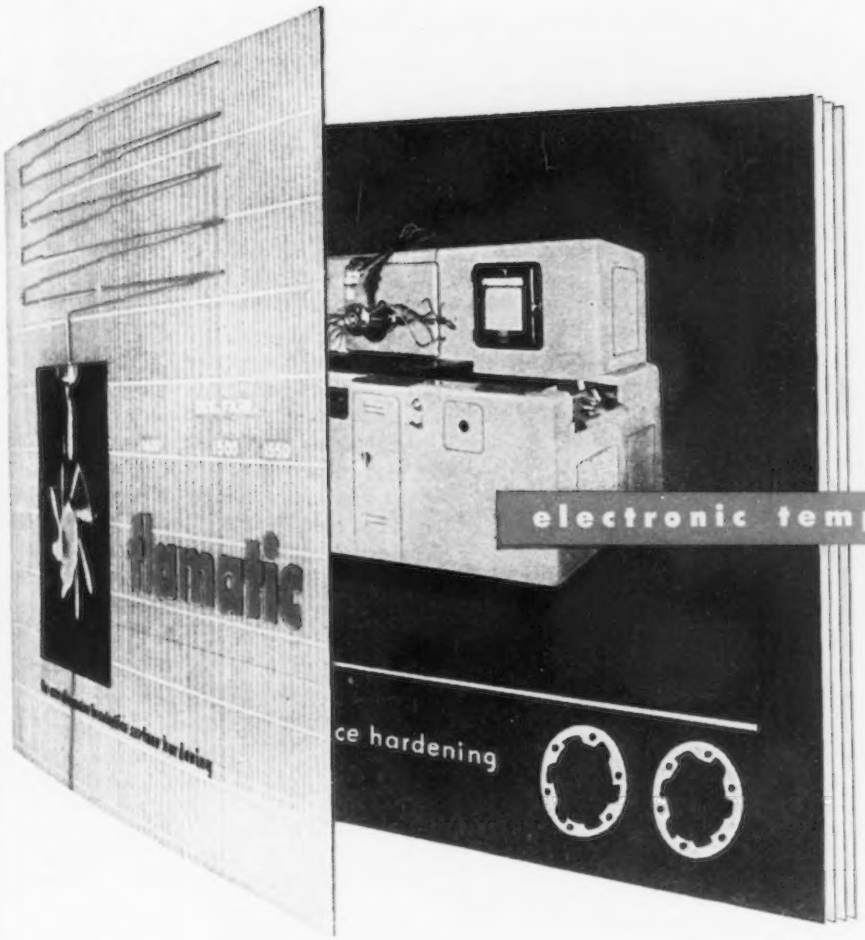
# flamatic

## exhibit

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**THE CINCINNATI MILLING MACHINE CO.**

*Cincinnati 9, Ohio, USA*

CINCINNATI

following suggestions or some modification thereof:

(1) The mills should exercise better supervision over their accounts and should take whatever steps are necessary to enforce their sales and distribution policies. Appropriate investigation should be made of all customers including manufacturers and warehousemen, to see that the steel is being properly utilized and not being sold into the gray market. Acceptance of orders could specifically provide, in all cases, that diversion or unauthorized resale would constitute cause for discontinuance of sales of steel.

(2) The mills should exercise as much diligence in the sale of wasters, seconds, overruns, and all types of off-grade material, as they do in the sale of prime materials. From the subcommittee's investigation, it appears that the mills have been too lax in this matter and as a result much steel has reached the gray market.

(3) The mills should desist from trading steel ingots, slabs, coils, sheet bar, sheet, strip, etc., to scrap dealers in return for scrap. In every case of this nature investigated by the subcommittee it was found that the finished product was going into the gray market at premium prices.

(4) Conversion deals should be limited to those in which the mill deals directly with the manufacturer who is to use the steel.

(5) The mills should take appropriate action to see that semi-finished material is not supplied to rolling mills whose output finds its way, either directly or indirectly, into the gray market.

(6) The subcommittee has found that the steel industry's attempt to police itself has not been coordinated or set up in such a way as to insure the most effective results, although individual mills, in some cases, have exhibited a well-organized program, it is, therefore, recommended that all steel producers contribute to the formation of an organization to conduct impartial investigations and make reports of its findings to the steel industry.

The scrap industry is taken to task for its part in barter deals and it is suggested that "scrap dealers who are not engaged in such practices would do well to take immediate action through their organizations to clean up the situation before the entire scrap industry falls into thorough disrepute."

The committee also found that one of the large sources of gray market steel is the sale of excess stocks by steel fabricators. Accordingly, it recommends the establishment of some central clearing agency to sell excess stocks at legitimate prices, such an organization could be sponsored by one or more trade associations, possibly the steel purchasing agents' Assn.

IT was further found that the federal government has been indirectly responsible for some steel getting into the gray market. The following recommendations are made in regard to government:

(1) The congress should consider the advisability of enacting appropriate legislation to encourage the operation of steel facilities which, because of their high operating costs, are at present lying idle. It is suggested that such encouragement might take the form of tax benefits allowing accelerated depreciation schedules for such facilities.

(2) The subcommittee has been advised that the ECA does not consider that it is authorized under existing legislation to obtain, by purchase or otherwise, iron and steel scrap on a quid pro quo basis from the 16 participating nations. The congress should take immediate action to clarify this matter.

(3) The congress should immediately authorize the purchase of foreign scrap to be converted into ingots for the purpose of stock piling.

(4) It is recommended that the War Assets Administration be specifically authorized to include in all contracts covering the sale or lease of any government facility reasonable safeguards to prevent the output of the said facility from reaching the gray market, either directly or indirectly.

(5) Closer liaison should be maintained between the Federal Power Commission and the Office of Industry Cooperation so that some balance can be maintained between the authorization for the construction of public utilities and the allocation of steel required for such construction.

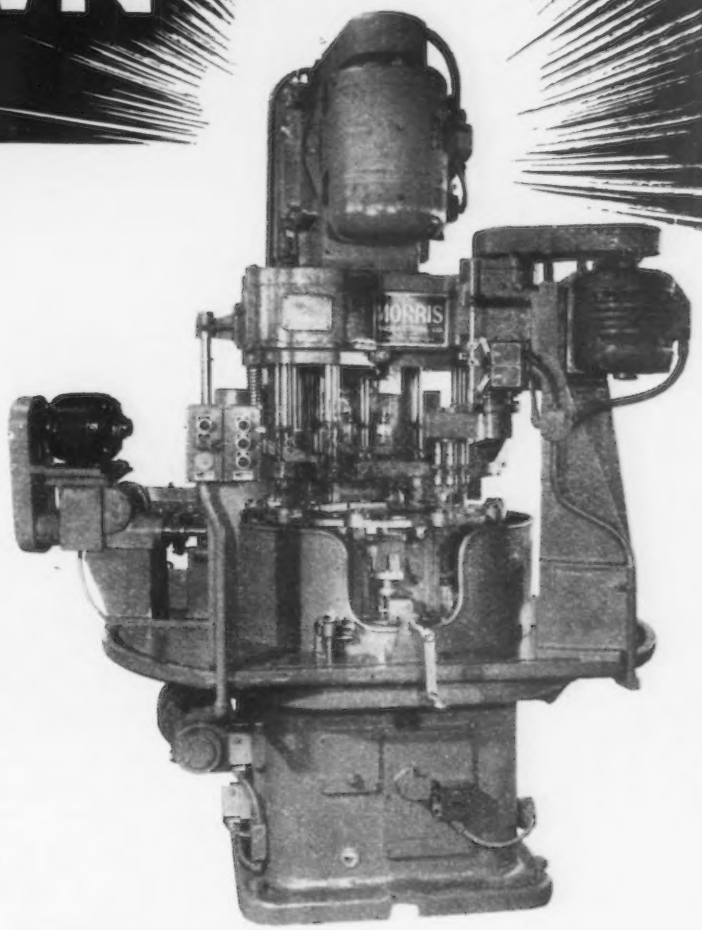
THE BULL OF THE WOODS — BY J. R. WILLIAMS

# Productivity Goes UP
# Costs Go DOWN
## with
# MORRIS
## MOR-SPEED
## PRODUCTION MACHINES

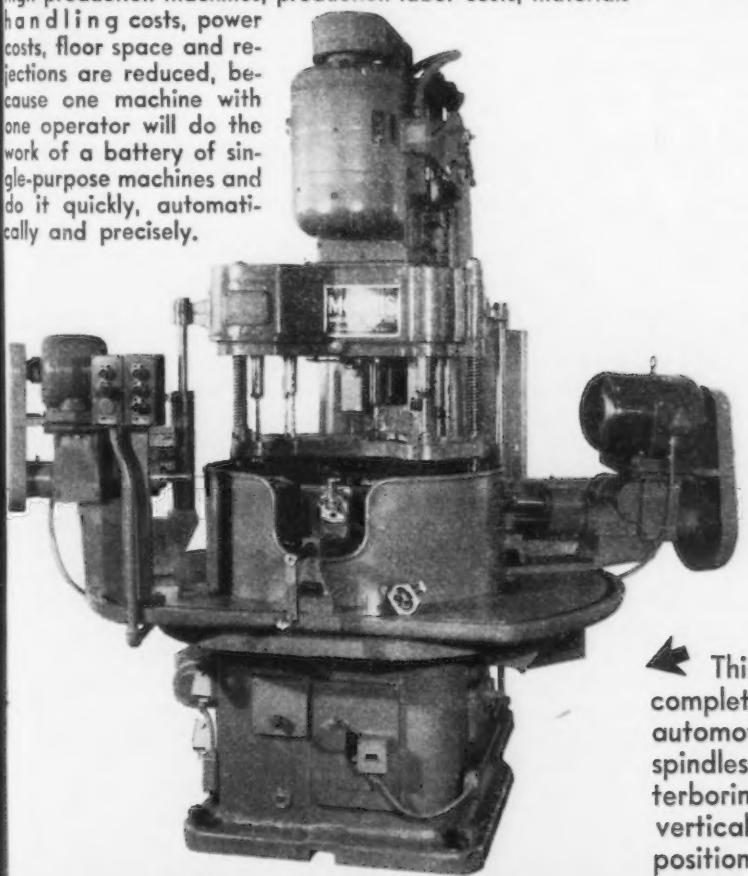
MORRIS high production machines, designed to your job, solve problems in drilling — reaming — chamfering — spotfacing — counterboring — and tapping on production runs. These multi-station, multi-operating machines complete the job in one handling. The resultant increased productivity, lower unit cost, and higher quality product are definite savings.

One operator loads and unloads the work. The machining cycle is automatic and continuous.

By replacing lines of single purpose machines with MORRIS high production machines, production labor costs, materials handling costs, power costs, floor space and rejections are reduced, because one machine with one operator will do the work of a battery of single-purpose machines and do it quickly, automatically and precisely.




This MORRIS hydraulic vertical ten-station machine was built to drill, ream and tap an automotive oil pump housing. Twelve vertical drilling spindles, two vertical reaming spindles, four vertical tapping spindles and one horizontal drilling spindle complete this work automatically and with precision. Ten hand clamping fixtures position the work.



This MORRIS hydraulic vertical six-station machine completely drills, reams, counterbores and spotfaces an automotive oil pump housing. It has four vertical drilling spindles, two vertical reaming spindles, one vertical counterboring spindle, three horizontal drilling spindles and one vertical spotfacing spindle. Six hand clamping fixtures position the work.

Builders of MOR-SPEED Lines

The MORRIS Machine Tool Co.

CINCINNATI 3, OHIO

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# MORRIS

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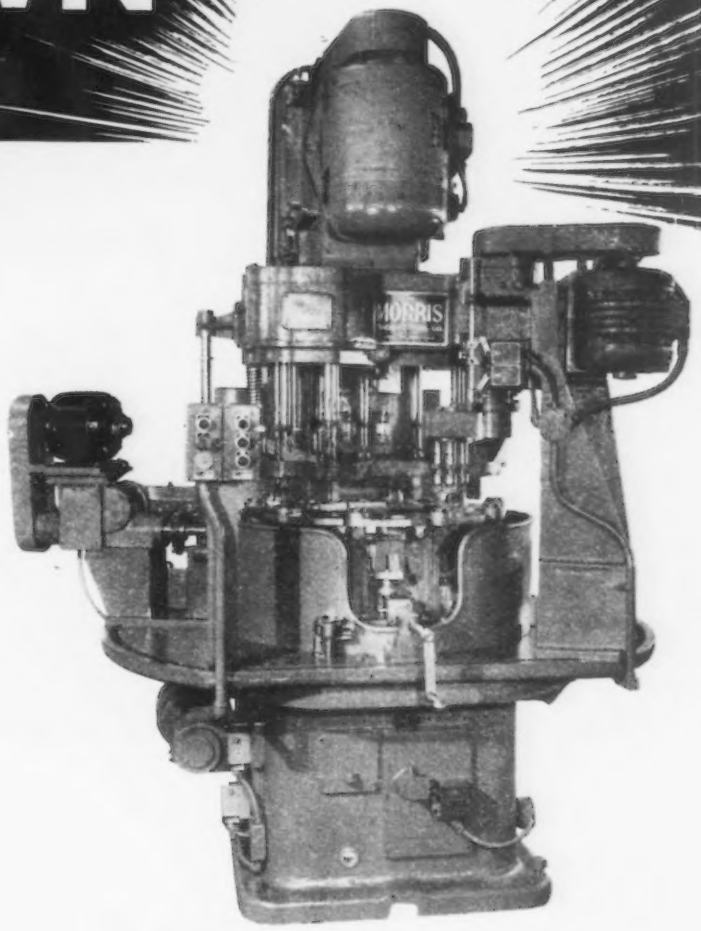

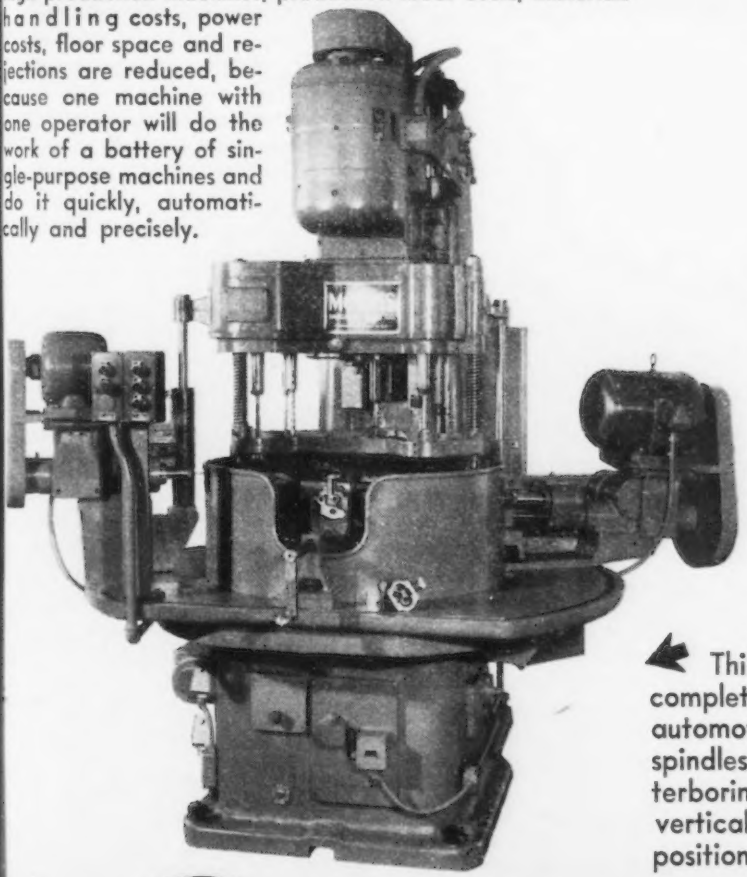

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Builders of MOR-SPEED Lines

The MORRIS Machine Tool Co.

CINCINNATI 3, OHIO

# West Coast . . .

OSGOOD MURDOCK

**• Southern California foundries studying and testing methods to overcome "smog" air pollution . . . Big plant at Sunnyvale bought by Westinghouse.**

LOS ANGELES — With public resentment mounting as barrages of smog have become more frequent in the Los Angeles area, steel mills and ferrous foundries have launched a costly program to minimize whatever portion of the air pollution they may be contributing.

Experiments, which are with little precedent, are being made to determine the most economical methods of cleaning smokes and dusts being sent into the air.

Smog air pollution first became of general concern to southern California residents during the war. It descends on the area like fog during days when there is little or no wind. In addition to clouding the atmosphere, on severe days it irritates the eyes of persons downtown. First speculation was that it was caused by specific industries, such as synthetic rubber, but more investigation showed that it probably was the result of greatly increased industry, more diesel trucks, open fires and a dozen similar causes. Regardless of the cause, smog continues to exist.

Although it passed an act in 1947 regulating air pollution, the county of Los Angeles is only beginning a long and intensive program necessary to return to prewar standards. Saddled with the job of eliminating the pollution is Dr. Louis McCabe, who has been at work for the past year, assisted by a staff of scientists and investigators.

Extensive tests are being carried on by the foundries and the Los Angeles County Air Pollution Control District to determine stack loading, mass rate of emissions and the nature and particle size distribution of dusts going to the atmosphere.

The comparative economies and efficiencies of a baghouse roto-clone, hydro-clone and pack tower are being determined in a study launched jointly by 37 non-ferrous foundries in the area. Consulting laboratories are surveying the operations of three foundries where pilot equipment has been installed. At the American Brass & Aluminum Foundry, a baghouse installation is being tried. National Brass Works, Inc., has an American air filter, a wet type roto-clone, and Aluminum Brass Foundry will use a Whiting Corp. hydro-clone.

The baghouse installation at American Brass & Aluminum is at present complete but is operating unsatisfactorily unsofar as hood and duct design are concerned, according to Dr. McCabe. "The baghouse itself is performing well but the pickup of the contaminated air and products of combustion in the hood collection is poor," he states.

Redesign and modification of the hoods and duct system has been started to allow for the aspirating effect of the high velocity discharge of products of combustion from the furnaces.

IN the roto-clone installation at National Brass Works, the hood design fault again was apparent, but it was corrected more easily. "Some trouble has been encountered with the roto-clone itself as to the wetting properties of water in the scrubbing action of lead and zinc oxide," Dr. McCabe comments.

Results from a hydro-clone pilot installation at Aluminum Brass Foundry in November, are not expected until after the first of the year.

Working through the Gray Iron Foundrymen's Assn., 60 ferrous foundries have approached the problem through the assignment of seven laboratories to make basic tests of representative cupolas under the supervision of Col. Rufus W. Putnam and associates. Colonel Putnam is a former district engineer for the Army in the Los Angeles area.

A series of tests is being completed by the seven laboratories, each of which is a specialist in one phase of the field. They include Albert L. Chaney, Kennard & Drake, Los Angeles Testing Laboratory, Menardi & Co., Smith-Emery Co., Truesdail Laboratories Inc., and California Testing Laboratory Inc.

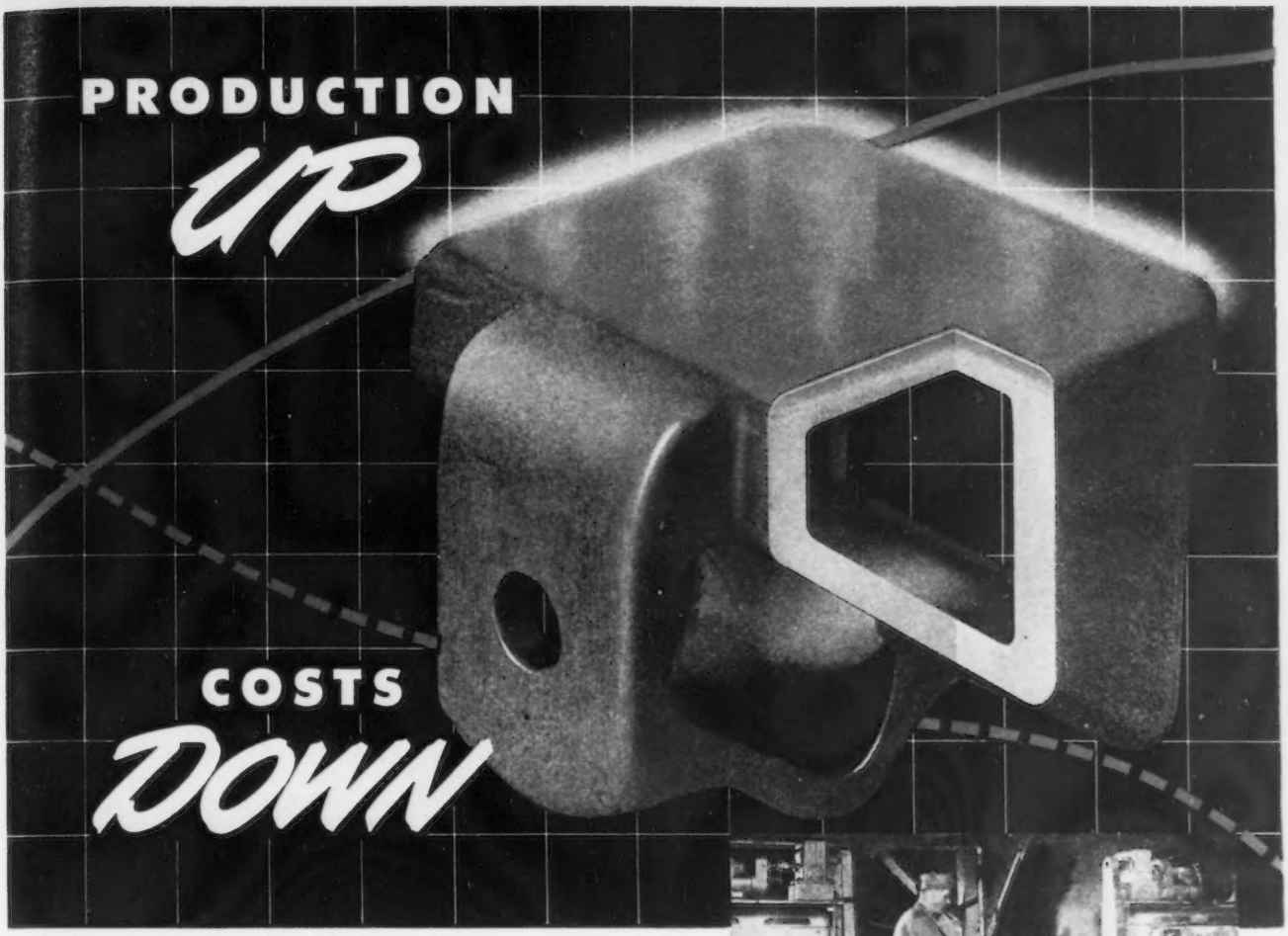
The cupolas of the foundrymen's association are divided into three classes for test purposes: (1) Small cupolas below 40 in. (2) Middle range cupolas from 40 to 60 in. (3) Large range cupolas, above 60 in.

"Basic tests are planned on runs on one small cupola operated on an average tonnage melt and on two of the medium range (48 in. cupolas), one operated on a small tonnage melt and another on a high tonnage melt," Dr. McCabe explains.

"It was the opinion of the technical group that these sizes would give the necessary engineering data on particulate size and particulate size distribution required for the selection of remedial equipment. In the basis tests $CO_2$, CO and $O_2$ were determined by Orsat apparatus and complete chemical analysis of the solid particulate matter in the flue gases was made," he adds.

STANDARDS established for control of stack emissions will be based on the mass rate of emissions, rather than on stack concentration.

Much of the scrap for openhearth furnaces operated by Columbia Steel Co. at Torrance and Bethlehem Steel Co. at Vernon (both adjoining Los Angeles) contains a high percentage of brass and zinc which is reflected in stack emissions

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in the form of lead and zinc oxides, Dr. McCabe believes.

The two companies are participating in a pilot plant test with the installation of a $100,000 Pease Anthony Venturi scrubber at the Bethlehem mill. The plant, installed by Chemical Construction Co. of New York, has been in operation for 6 weeks, scrubbing approximately 10 pct of the gases from one openhearth furnace.

The tests indicate that the equipment will reduce stack loadings to between .03 and .07 grains per cu ft at standard conditions, according to the air pollution control director.

A controversy has arisen over reports concerning contribution to the smog by the oil industry, Dr. McCabe reports.

"Great quantities of sulfur compounds are released to the atmosphere in Los Angeles from refineries, chemical plants, foundries and the burning of fuel oil by other industries. Sulfur balance recently supplied by the petroleum industry indicates that about 800 tons of sulfur compounds calculated as sulfur dioxide enter the Los Angeles atmosphere each day from petroleum products.

"Due to fog-forming qualities of sulfur trioxide and sulfuric acid mist, standards below the present .2 pct by volume will be established for sulfur compounds. The extremely low visibility that occurs on many days in Los Angeles when the humidity is too low for natural fog formation is attributed to sulfuric acid mist which is released directly from industrial stacks or is formed from sulfur dioxide in the atmosphere in the presence of sunlight."

The charges against petroleum refiners are denied by W. L. Stewart Jr., of the Western Oil & Gas Assn.

"Less sulfur dioxide is entering the Los Angeles atmosphere today than at any time since before the war. No practical process is known which might further reduce the concentration," he states.

"The oil industry has for more than 15 months been carrying out the largest program of scientific research on smog so far undertaken by any organization. Particularly do we doubt whether the real cause of smog has yet been discovered or that the report charging the petroleum industry as a principal offender is justified by the facts so far presented," he adds.

## Westinghouse Purchases 57 Acre Sunnyvale Plant

*San Francisco*

• • • **For $3,472,151** Westinghouse Electric Corp. has purchased the 57 acre Sunnyvale Works of the Joshua Hendy Iron Works. This plant was leased 19 months ago for a 10-year term with option to purchase before Dec. 1, 1948, and present announcement confirms the exercise of the option.

According to Robert A. Neal, vice-president and general manager of western operations for Westinghouse, the company has invested several million dollars in additional machinery, equipment and inventory since initially occupying the plant under lease for the production of a wide variety of electrical and steam apparatus and large hydraulic valves. Production is increasing on large oil circuit breakers, distribution and power transformers, alternating current motors, steam turbines up to 12,500 kw generating capacity, 5000 kw packaged power plants, voltage regulators, air moving equipment, gears, switchgear and numerous other products.

Employment at Sunnyvale, about 1100 a year ago, now numbers 1800 men and women and for 1949 it is anticipated that the personnel will be 2700 and annual shipments will be at the rate of $30 million.

## Executives Attend Opening

*San Francisco*

• • • **Headed by president** Fairless and chairman Olds the entire board of directors of U. S. Steel Corp. will attend the opening of Columbia Steel Co.'s new multimillion dollar steel sheet and tinplate mill at Pittsburg, Calif. Thursday, Oct. 21. The group will arrive in San Francisco Oct. 20, and will spend Friday, Oct. 22 in Los Angeles inspecting corporation properties in that area.

The new cold-reduction sheet and tinplate mill occupies 24½ acres of the plant's 400 acres and is a modern continuous operation. On Friday, Oct. 22, the day following the dedication ceremonies, the entire Pittsburg plant will hold an open house for the general public and families of employees.

## Rate Hike Aids Expansion

*San Francisco*

• • • **In connection** with its recent application for an average 12½ pct increase in gas service rates to residential, commercial and industrial customers, its first gas rate increase in 28 years, the Pacific Gas & Electric Co. announces that the added revenue from the proposed rate increase will amount to about $6 million, less than the increase in cost of natural gas purchased by the company, effective next January.

Among the company's expansion plans to provide for unanticipated growth in population and industry in central and northern California is a 510 mile pipe line from the California - Arizona border to a point near San Jose for the direct delivery of natural gas from New Mexico and Texas. The estimated cost of this line is $60 million.

## Ships Rail Cars to Alaska

*Seattle*

• • • **Two new Puget Sound** producers of railway car equipment made initial shipments to Alaska earlier in the month when four streamlined railway passenger coaches and seven freight gondolas were loaded on shipboard for the Alaska R. R. Puget Sound Bridge & Dredging Co., wartime shipyard, converted the coaches from Army hospital cars as its first postwar railway project. Each car weighs 80 tons and they were loaded for their sea journey by a 100-ton floating crane with 125-ft boom.

The seven gondolas were rebuilt and converted from Army kitchen and troop sleeping cars by the Chicago Car & Freight Parts Co. at its Auburn, Wash., plant.

## Blast Furnace Breaks Down

*Salt Lake City*

• • • **A breakout** around the tap hole of No. 1 furnace at the Geneva Steel Co. has forced another month-long curtailment by one-third of sorely needed pig iron production in Utah. The No. 1 furnace broke out shortly after No. 3 was back into production following a shutdown of several weeks for repairs.

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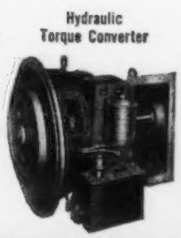
Users of small motors and internal combustion engines can now have all the advantages of fluid drive—at a very low cost. Twin Disc Hydraulic Engineers have designed a new hydraulic-conversion unit especially for small motors and engines. The new Twin Disc Hydro-Sheave Drive is a complete, easily-installed, low-cost transmission unit.

The Hydro-Sheave Drive is as easy to install as an ordinary sheave . . . sliding over the motor or engine shaft where it is held in place by three set screws. The unit is ready for immediate use . . . filled with hydraulic fluid . . . anti-friction bearings lubricated for life. Twin Disc Hydro-Sheave Drive is designed especially for use with Worthington QD (quick detachable) Sheaves, and is available in five sizes for use with any motor or engine in the ¾ to 25 hp range.

Built by the largest manufacturer specializing in friction clutches and hydraulic drives, Hydro-Sheave Drive is the simplest and most economical fluid power transmission available today. For complete information, including prices and the location of your nearest distributor, write to the Hydraulic Division for Bulletin 145. TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Division, Rockford, Illinois).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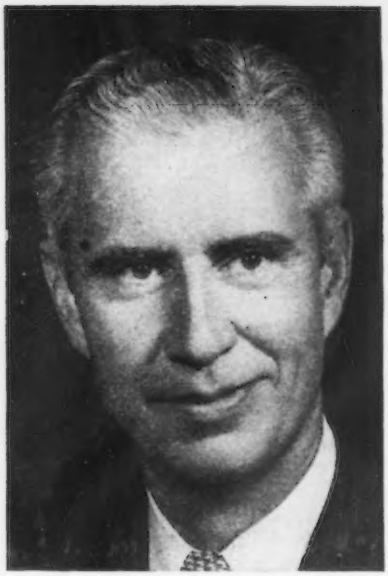
SPECIALISTS IN INDUSTRIAL CLUTCHES SINCE 1918

# PERSONALS



M. B. ROBB, home heater sales manager, Norge Div., Borg-Warner Corp.

• **M. B. Robb** has been appointed home heater sales manager of the Norge division of Borg-Warner Corp., Detroit. **R. C. Connell** has been appointed gas range sales manager and **J. Edward Wyatt, Jr.**, contract sales manager.

• **J. Norman Quinlan** has been promoted from division superintendent of the west mills at the Gary Works of Carnegie-Illinois Steel Corp., to assistant to the general superintendent of the plant. Mr. Quinlan has been associated with Gary Works since 1907 and has been division superintendent for the last eight years. **Charles J. Hunter** succeeds Mr. Quinlan. Mr. Hunter joined Carnegie in 1935 as metallurgist in the Pittsburgh district and came to the Gary Works in 1944 as chief metallurgist. Three years later he became chief inspector. **Oscar Pearson** succeeds Mr. Hunter as chief metallurgist and inspector. Mr. Pearson joined the corporation in 1928, starting at the Ensley, Ala., plant of the Tennessee Coal, Iron and Railroad Co. Seven years ago he came to Gary as assistant to the chief metallurgist. **Ragnar Overberg** succeeds Mr. Pearson as assistant in steel production and central mills. Mr. Overberg joined the Gary works in 1925.

• **H. J. Zentner** has been elected president and treasurer of the Safety Tool Corp., Watertown, N. Y. **Glenn R. Shriver** has been elected vice-president; **Mrs. Jacqueline Zentner**, secretary, and **Howard F. Farrington**, comptroller.

• **Charles W. Schuck** has been appointed general superintendent of the Braeburn Alloy Steel Corp. plant in Braeburn, Pa. Mr. Schuck has served the corporation in the last eight years as metallurgist in charge of quality control.

• **Charles Kinghorn,** formerly vice-president and chief engineer of Cresswell Roll Forming Co. of Montreal, has joined the Permanente Metals Corp., Oakland, Calif., directing the new roll forming program at the Trentwood mill in Spokane.

• **James F. McCrudden, Jr.,** has returned from the West Coast to take a new position as merchandising manager of the Korhumel, Heffron & Preiss Steel Co., Evanston, Ill.

• **A. R. Maune** has been promoted to superintendent of the Fulton, Mo., plant of Harbison-Walker Refractories Co., Pittsburgh, succeeding H. L. Harrod. Mr. Maune became associated with Harbison-Walker in 1930 and in 1943 was named assistant superintendent of the Vandalia, Mo., works, in which capacity he has served until his new appointment.

• **Lewis P. Naylor** has been appointed sales manager of the Ozalid Div., General Aniline & Film Corp., New York. Mr. Naylor had formerly been associated with Victor Adding Machine Co. and Remington Rand, Inc.

• **George C. McClure,** who has been purchasing agent for the North American Refractories Co., Cleveland, for the past 18 years, has retired. **Robert L. Lehr,** formerly assistant purchasing agent, has been named to succeed Mr. McClure.

• **O. W. Schmidt** has been appointed Central States district sales manager for Atlas Chain & Mfg. Co., Philadelphia, with his headquarters in Chicago. Mr. Schmidt formerly served as sales manager for the Shafer Bearing Co.

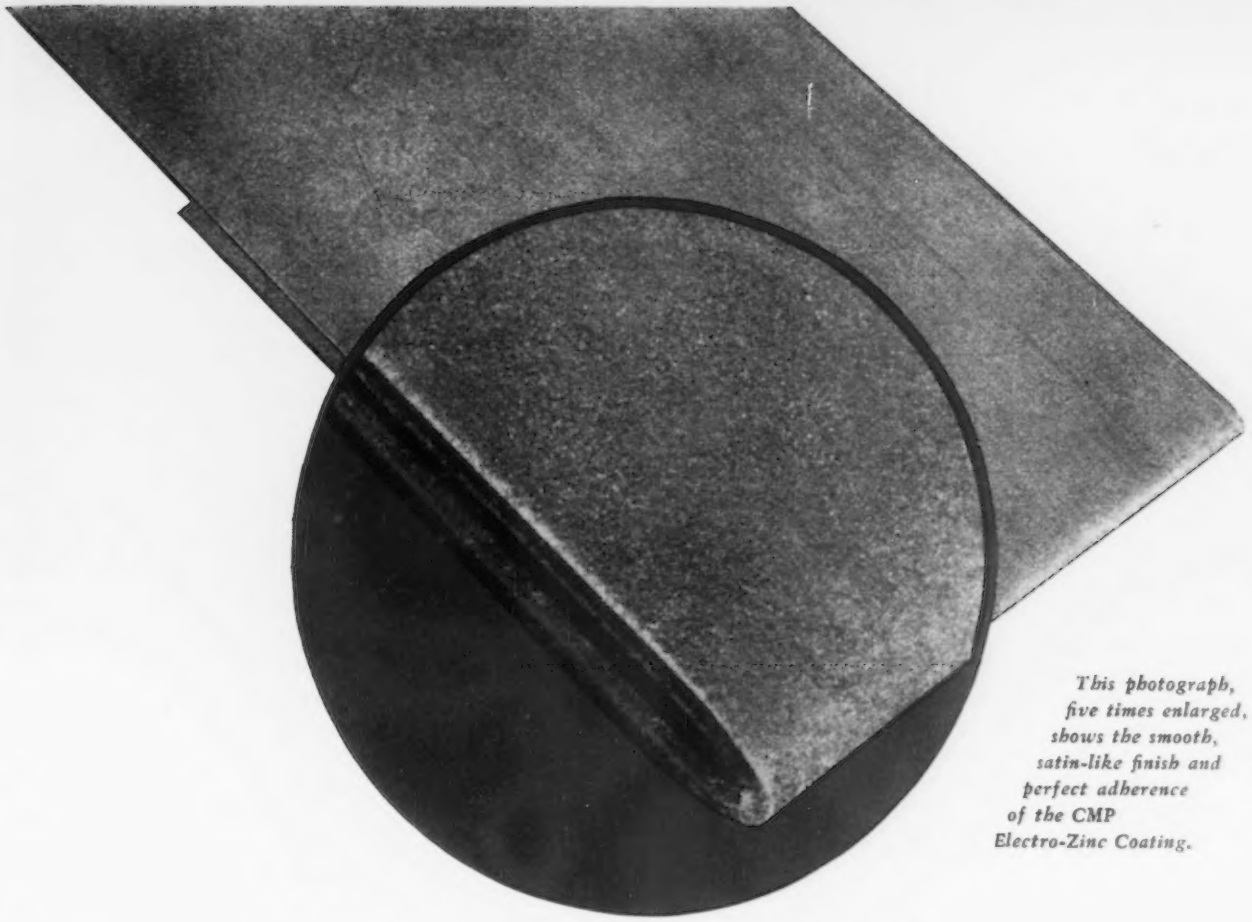
• **William H. Moore** has been elected a director and member of the executive committee, American Can Co., New York.

A. M. CALLIS, general sales manager, Federated Metals Div., American Smelting & Refining Co.

• **A. M. Callis,** formerly sales manager of the Chicago territory of Federated Metals Div., American Smelting & Refining Co., has been appointed to the newly-created post of general sales manager. **J. W. Kelin,** formerly sales manager of the St. Louis territory, succeeds Mr. Callis in Chicago. **Paul H. Jackson** has been named to succeed Mr. Kelin in St. Louis. Mr. Jackson formerly served as district sales manager in Seattle.

• **R. R. Donaldson** has been named vice-president in charge of engineering, Hagan Corp., Pittsburgh. He formerly served as chief engineer. **M. J. Boho** has been elected vice-president in charge of sales. Mr. Boho joined Hagan in 1936 as field service engineer. In 1945 he was appointed assistant general manager of sales. **E. W. Butzler** has been appointed business manager of Hall Laboratories, Inc., Pittsburgh. Mr. Butzler served for many years as an engineering consultant for the company and Hall's parent firm, Hagan Corp. **Owen Rice,** former manager of the Calgon Threshold Dept., has been elected vice-president in charge of commercial chemical sales for Calgon, Inc., Pittsburgh, a Hagan Corp. subsidiary. Mr. Rice joined Hall Laboratories in 1937 as research engineer.

• **Frank E. Sagendorph,** 3rd, has been elected vice-president in charge of research engineering, Penn Metal Corp. of Pa., Philadelphia.



*This photograph, five times enlarged, shows the smooth, satin-like finish and perfect adherence of the CMP Electro-Zinc Coating.*

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• **F. A. Maskell** has been appointed sales representative of the New York Belting & Packing Co., Passaic, N. J., covering the states of Colorado, Utah, Arizona, and New Mexico, with his headquarters in Salt Lake City. Mr. Maskell has served in various executive capacities with Sioux City Iron Co. and Hendrie & Bolthoff Co.

• **Mark T. Anthony** has been appointed assistant to the vice-president and general manager of Kaiser Co., Inc., Iron & Steel Div., Oakland, Calif. Mr. Anthony has been in the cost and commercial planning division of the company for the past three years. **Earl S. Reynolds** has been appointed director of public relations in Southern California for the company. Mr. Reynolds has been in public relations work for many years and has held various positions with the Kaiser interests, the last of which was manager of Fleet Sales in Southern California for the Kaiser-Frazer Corp. His new headquarters are at Fontana, Calif.

• **James F. Curtis** has been appointed plant manager of the brass mill at Thomaston, Conn., for The Plume & Atwood Mfg. Co., Waterbury, Conn. Mr. Curtis has formerly been associated with Revere Copper & Brass, Inc.

• **Harry E. Seim** has been appointed general manager of the Sturtevant Div. of Westinghouse Electric Corp., at Hyde Park in Boston, and **Tom Turner** has been named general manager of the Elevator Div. at Jersey City. Both men retain their former posts in addition to assuming their new duties. Mr. Seim, vice-president and general manager of the Bryant Electric Co., a totally-owned subsidiary of Westinghouse, temporarily continues to make his headquarters in Bridgeport. Mr. Turner has his office in the Elevator Div. plant but retains his position as general manager of the Westinghouse Meter Div. in Newark, N. J. Messrs. Seim and Turner replace **Ellis L. Spray,** vice-president in charge of the Elevator and Sturtevant divisions, who is retiring.

• **John A. Storrs** has been appointed sales representative in the New York district for Kennametal, Inc., Latrobe, Pa.

R. NEVIN WATT, vice-president, Baldwin Locomotive Works.

• **R. Nevin Watt** has been elected vice-president in charge of sales of the Baldwin Locomotive Works, Philadelphia. Mr. Watt entered the employ of Standard Steel Works Co., now Standard Steel Works division of Baldwin, in 1913. He has been serving as assistant vice-president, domestic sales, since early this year.

• **Joel A. Wier** has been named regional manager for the southeastern territory for Fedders-Quigan Corp., Buffalo. Mr. Wier has his headquarters in Atlanta. He was formerly associated with Chas. S. Martin Distributing Co. **Henry F. Goetz** has been named sales engineer of the condenser division of the Fedders-Quigan Corp. and **William W. Reeves** has been appointed applications engineer.

• **C. S. McIntyre** has been elected president of the Newgren Co., Butler, Pa., succeeding **George M. Newlin** in that capacity. Mr. Newlin remains a director of the company.

• **Robert S. Bowie** has been appointed director of the new Chicago branch sales office of the Cooper-Bessemer Corp. Mr. Bowie has been associated with Cooper-Bessemer since 1936 in other sales capacities. Mr. Bowie's activities continue under the supervision of **Charles L. White,** district manager for Cooper-Bessemer in the north central area.

• **H. N. Kirchdorfer** has been named eastern division sales manager of the Parts Div., Reynolds Metals Co., with headquarters in New York. Mr. Kirchdorfer joined the Reynolds organization 14 years ago. In 1943 he was named assistant vice-president, which title he retains. **Harry H. Armstrong** has been appointed sales specialist assigned to Reynolds Chicago sales office. Mr. Armstrong had formerly been associated with the Stran-Steel division of Great Lakes Steel Corp.

• **A. A. Vetter** has been appointed consulting sales engineer for the Buhr Machine Tool Co., Ann Arbor, Mich. Mr. Vetter joined the company 18 years ago and for the past seven years he has served as plant superintendent.

• **V. Paul Yale** has been named district representative in the states of Michigan and Indiana for the Walker-Turner Div., Kearney & Trecker Corp., Milwaukee.

• **Ralph M. Hoffman,** president of Link-Belt Co., Pacific Div., has been elected a vice-president of the parent Link-Belt Co. Mr. Hoffman joined the predecessor of the Pacific Coast company, Meese & Gottfried Co., in 1913. He has served in many executive capacities in both the parent and subsidiary companies and continues as president of the Pacific Div., Link-Belt Co., the position he had held since 1943. **H. F. R. Weber** has been appointed representative of Link-Belt to the pulp and paper industry, with his headquarters in the company's Pershing Road plant in Chicago. Mr. Weber joined the company in 1915 and since 1945 has been divisional manager for silent chain drives with headquarters in Indianapolis.

• **B. F. Bilsland** has been promoted to manager of the newly-formed mid-west region of the Allis-Chalmers Co., with his headquarters in Chicago. Mr. Bilsland joined Allis-Chalmers in 1919 and has been manager of the Chicago district for the past 15 years. **J. C. Collier,** who has been employed by the company since 1916, succeeds Mr. Bilsland as Chicago district manager. Mr. Collier has been connected with the Chicago office since 1929.

A. J. LINK, district sales manager, Signode Steel Strapping Co.

• **A. J. Link** has been named Chicago district sales manager of Signode Steel Strapping Co., directing company sales in Minnesota and Wisconsin as well as the Chicago sales area. For the past seven years Mr. Link has held the post of sales representative with headquarters in Indianapolis. M. C. Carlson, assistant sales manager and formerly Chicago district sales manager, devotes his entire activities to the control of field sales organization.

• **George C. Trevorrow** became general superintendent of coal mines, Wheeling Steel Corp., Wheeling, W. Va. Mr. Trevorrow has formerly been associated with Duquesne Light Co. He now has responsibility for operation of both Wheeling Steel and Consumers Mining Co. coal mines.

• **Marcus A. Markley** has been named manager of Sun Oil Co.'s industrial products department in Philadelphia, succeeding **Ray H. Anders,** who has been assigned to special work in the administrative department. Mr. Markley has been industrial products division manager of the New York region since 1939. **James E. Stine, Jr.,** formerly industrial products department manager, New York district, succeeds Mr. Markley and **Francis F. Palmer** who has been serving as industrial products salesman at Rochester, N. Y., succeeds Mr. Stine.

• **Dan Mandery** has been named to head the Platecoil Div., Kold-Hold Mfg. Co., Lansing, Mich. Mr. Mandery formerly served in Frigidaire sales and service, with the Hussman Refrigerator Co. and Universal Cooler.

• **Laurence F. Kedzie** has been appointed assistant director of purchases and **Jack A. Faulkner,** purchasing agent, Bendix Home Appliances, Inc., South Bend, Ind. Mr. Kedzie joined the company in 1937 and has been assistant purchasing agent since 1946. Mr. Faulkner joined Bendix Home Appliances in 1944 and for the past 18 months he has been a buyer.

• **E. A. Swan,** assistant to the manager at Bethlehem Steel Co.'s Hoboken, N. J., yard for the past seven years has been appointed manager of the Atlantic and Simpson repair yards at the company's East Boston plant.

• **Jack R. Koske** and **Paul E. Miller** have been appointed to the board of regional sales supervisors, Eutectic Welding Alloys Corp., New York, Mr. Koske covering the east central United States and Mr. Miller mid-east United States.

• **John H. Bryan, Jr.,** has been appointed district sales manager of the New York office of Bliss & Laughlin, Inc., succeeding his father, **J. Harvey Bryan, Sr.,** who has represented the company in the New York district since 1930.

• **Harold F. White** has been chosen president of Blake & Johnson Co., Waterbury, Conn., succeeding **John P. Elton,** who died. Mr. White continues as treasurer of the company. **Edward Downs** has been elected secretary, **Chester P. White** assistant treasurer and **Ridgway M. Hall,** assistant secretary and member of the board. **Elton S. Wayland** has been named chairman of the board. **Chester White** and **Perry White** were also elected members of the board.

• **James G. Tweedell** has joined the New York staff of the International division, Carrier Corp., Syracuse, N. Y.

• **Dr. Edward J. Lauth, Jr.,** has been appointed medical supervisor of the Dravo Corp., Pittsburgh, and its subsidiaries.

WILLIAM D. MOSS, traffic manager, Eaton Mfg. Co.

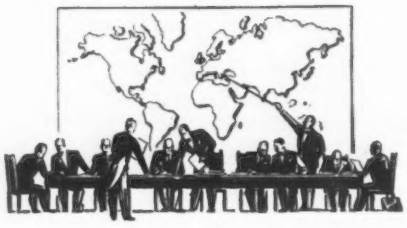
• **William D. Moss** has been appointed traffic manager for Eaton Mfg. Co., with headquarters in Cleveland. Mr. Moss came to Eaton from Montgomery Ward & Co. where he served as assistant traffic manager in the New York office.

• **William J. Swallow,** assistant manager of the Ford Motor Co. assembly plant at Atlanta, has been named manager of the Buffalo assembly plant, succeeding **Edward C. Miller,** who becomes manager of the Dearborn assembly plant.

• **Osborne Bezanson** and **R. R. Cole,** vice-presidents of Monsanto Chemical Co., has been named to the executive committee of the company. Mr. Bezanson formerly served as general manager of the organic chemicals division, with headquarters in St. Louis. He has been succeeded in that position by **W. G. Krummrich,** formerly assistant general manager of the division. Mr. Cole, who formerly served as general manager of the company's phosphate division, has been succeeded by **John Christian,** formerly manager of the company's plant at Monsanto, Tenn. **Fred G. Gronemeyer** has been appointed to the newly-created post of chief engineer of the company's organic chemicals division. For the past 16 months Mr. Gronemeyer has been director of general engineering and continues in charge of that department until a successor has been appointed.

# European Letter . . .

**• Berlin not typical example of issues between Russia and West . . . Soviet fights rearmament measures made necessary by constant Russian provocation . . . Stalin would like Western Powers to build war scare.**



LONDON—The pent-up secrecy over the Berlin negotiations has broken. In a spate of words pouring from foreign offices, news agencies, reporters and commentators, the world is learning, down to the minutest detail, the course which led to the final breakdown of the talks. From being the world's best kept diplomatic secret, the negotiations have become, overnight, the most fully documented of all contemporary disputes. Nor is it simply a question of throwing the searchlights of publicity upon the past phases of the discussions. From the private conference table the whole dispute will now be transferred to the largest public forum in the world. The deadlock in Berlin has been referred by the three western powers to the United Nations and all future exchanges will have behind them an amplifier which will send the argument to the ends of the earth. Nor is it only information that has been suddenly released. Pent-up emotions are also finding expression. One of these emotions is indignation. But another is fear, and for the moment it is certainly not the weaker of the two. There has been something resembling a war scare.

At a time like this, the first imperative is clear thinking. And the first step in clear thinking is to sort out the issues. One point that needs to be made is that the risk of war, whatever it may be, is no greater now than it was in June, or even earlier. Nothing new has now suddenly emerged. All that has happened is that what was suspected years ago by a few, and what was apparent months ago to many, has now been proved to the public — namely, that agreement with the Russian Communists is impossible. It is only the proof that is new, not the fact. Moreover, it is important to note what it is that is now proved—that the Russians are not interested in international harmony. There is no more proof than there ever was that they mean to make war. There is, obviously, some risk that they do. But, again, it is not the risk that is new but the realization of it. And whether it be imminent or remote, there is no reason to suppose that it is any different today from what it has been for a long time past. It is right to see things realistically, and it is good that the public's eyes have been opened. The risk of war cannot, indeed, be dismissed; but to build up a war scare in September and October 1948 is to do Stalin's work for him.

*Reprinted from The London Economist by special permission.—Ed.*

A SECOND distinction of issues that needs to be made is to separate the specific dispute over Berlin from the wider problem of relations with Russia. The specific issue is dependent on the wider one, of course; if there were no general quarrel with Russia there would be no problem at Berlin. But Berlin is not a typical example of the issues that are likely to arise between Soviet Russia and the West; it has some peculiar features of its own, and to treat it as if it were merely one of a long list, past and future, of similar incidents can only be misleading.

For the moment, it is the Berlin issue that holds the stage. From the mass of information issued by both sides, the outline of the abortive negotiations emerges with sufficient clarity. The first phase ended on August 27 when, after Mr. Stalin's intervention, the western powers believed that they had virtually solved the crucial question of Four Power control for Berlin's currency and that agreed instructions could be sent to the Commanders in Chief in Berlin. When, however, negotiations were transferred to Berlin, the form they took finally convinced the Western Powers that the Russians were not, in fact, interested in securing an agreement. There was even a certain levity in the way in which Marshal Sokolovsky placed interpretations on the agreed instructions which seemed to be quite out of keeping with the previous discussions in Moscow. The turning point was reached, however, when the Marshal raised two entirely new points—the first, that all trade between Berlin and the West should come under Soviet control, the second, that in future the Western air corridors should be confined to uses specified by the Russians. Since this proposal would clearly deprive the Western Powers of their only safeguard against any future imposition of a blockade, there was no further point in negotiation. They decided to bring the whole dispute before the Security Council.

THE immediate outcome of this step is likely to be a tremendous intensification of the war of words. In laying the issue before the United Nations, the Western Powers are appealing to what is sometimes called the forum of world opinion. This phrase is, of course, entirely misleading. Beyond the Iron Curtain and wherever Communist influence is dominant, world opinion does not exist and the Western Powers could appeal to it until doomsday without one of their pleas and explanations passing through the censor's net.

(CONTINUED ON PAGE 248)

*MicroRold* STAINLESS STEEL

## makes better hospital equipment

*Official U. S. Navy Photograph*

HYDRO-THERAPY TANKS and a host of other hospital equipment give better, longer and more effective service when they're made of Micro-Rold stainless steel. Micro-Rold is smooth and shiny. It's easy to clean. Its dense, tough surface resists chips and scratches and isn't attacked by the solutions generally used.

### let's get technical . . .

There's a real reason why Micro-Rold stainless steel is better. Its uniformity of thickness and its improved surface result in a greater area per ton—and reduced finishing and polishing costs. Greater strength per pound is another outstanding attribute.

All this produces a real advantage to users of stainless steel products. You're getting better steel products—because Micro-Rold stainless steel is easier to fabricate.

Be Sure It's *MicroRold*

*Photo Courtesy Elkay Manufacturing Co., Chicago, Ill.*

WASHINGTON STEEL CORPORATION
*MicroRold*
STAINLESS
SHEET & STRIP

# WASHINGTON STEEL CORPORATION

**WASHINGTON, PENNSYLVANIA**

# Industrial News Summary...

- **Steel Gets Bellyful of Allocations**
- **Only Essentials May Remain in 1949**
- **Steel Supply Tighter Than Ever Now**

THE steel industry has had its bellyful of voluntary allocations. Because it would rather have that method than imposed government allocations, it will struggle along as best it can. The present law on voluntary allocations expires next February. Steel people have promised to take care of defense needs and maybe a few "must" programs after that time. They would do this whether or not there was a voluntary allocation plan in effect.

What steel officials are beginning to gag on is the ever greater number of orders coming under a plan which started out for "essentials." So much has the plan mushroomed that output of some products are 25 to 35 pct allocated. Steel people would toss the whole thing into an ash can if they could do what they really wanted to do. Since they can't do that they have given notice that as far as they are concerned the law can die next February. If it is extended there is little they can do except go along—under private protest.

The reason why the allocation program has outgrown its pants is simple. Every one who saw the next person get on the bandwagon made plans to climb aboard himself. This was not hard to do in an election year. Congressmen have been vocal and energetic in getting their constituents a hearing on steel supplies. The Office of Industrial Cooperation, backed by steel industry groups, has done everything it can to hold things in check.

As each new group was added to the list for preferred treatment, chances of "good" steel distribution faded. Now steel sales people hope that someway, somehow, total steel distribution will get back on a sane track. But behind all this is the capricious attitude that some congressmen have had on allocations. First they seemed to want a voluntary setup. Then they switched to stern pronouncements that maybe government controls were the answer. They have championed plans to return steel dividing to the industry. It is no wonder steel executives do not know where they stand.

AS long as the voluntary program or its threatened ally, government imposed allocations, are in the picture, steel distribution will not become better for underprivileged groups. There are too many customers who know how to apply pressure. And why not? As soon as they see one group get more steel than they think that group ought to have the idea is to "get theirs." There is nothing new in this—but it can raise hob with the whole list of steel consumers.

The cost of some automobile steel has taken another jump. Great Lakes Steel Corp., which often sets the price pattern in Detroit, has advanced the cost of hot-rolled sheets and strip by a figure estimated at between $13 and $15 a ton by increases in extra charges. About a fourth of the steel in an automobile is hot rolled sheet and strip. Other steel producers are now busily studying their costs on these products and if they come up with figures akin to those of National Steel Corp., they are also likely to revise their extra charges on hot-rolled sheet and strip too. Weirton Steel Corp., also a subsidiary of National Steel made similar advances.

Defense requirements reaching steel mills are not up to the quotas set aside for this use. In recent weeks the tempo of such orders has quickened. But with most steel concerns only 10 to 50 pct of the quotas have been used up so far. More tonnage for military orders is expected before the end of the fourth quarter. No steel company would take the chance of filling space on the mills that is earmarked for defense needs. Even at the last minute, mills will tear apart their rolling schedules to take care of military orders no matter how late they are received.

THERE is every indication that defense steel and other essential programs will run smack into domestic steel orders early next year. There is no chance that quotas will be any bigger in the first quarter of 1949. The reverse may be true. Detroit automakers are down in the dumps. They expect to be getting less steel than they need. Hence, they are going hell bent for election on conversion plans—both those in effect and any new ones that can be set up.

A rough guess is that some major auto firms are depending as much as 10 to 20 pct on conversion of ingots to provide the finished steel they need. Without this imagination and scurrying about auto steel would be a sad story.

The auto industry justly deserves a pat on the back for its conversion activities. It has hauled steel from one place to another in order to get the sheets and strip it needs. The costs have been heavy. That is part of the reason for high car prices. One auto company gets as much as 90 pct of its steel by way of steel conversions. Another gets 50 pct that way and there are at least three other important car makers who get as much as 30 pct of their steel via conversion.

This week the steel supply situation is tight—or tighter. With the latest crop of "we may be at the top and may go down soon" predictions there is no sign of falling off in steel business. It is a good bet that steel users will still be screaming for steel by next June and later. If defense picks up faster and if Western Europe is rearmed by the United States, then all bets are off as to when domestic steel users will get all they want.

Steel output this week hit a new high at 98.5 pct, up one point from a week ago. The 88 million-ton year, forecast by IRON AGE a few weeks ago, will be easy to make if this rate keeps up—as it likely will. This also means that last quarter earnings in the steel industry will be "very good."

• **REVISED REQUEST**—The nation's railroads on Oct. 12 requested the Interstate Commerce Commission to increase from 8 to 13 pct the rise in freight rates proposed in their original petition of Oct. 1. They also ask the original 8 pct request be granted as an immediate interim increase. The proposed increase of 13 pct would apply to most commodities, but on coal and coke the increases in the petition of Oct. 1 would be upped from 30¢ per net ton and 34¢ per gross ton to 40¢ per net ton and 45¢ per gross ton. On iron ore they would go up from 24¢ to 35¢ per net or gross ton, except for movements to upper lake ports for transshipment by water. Need for increases is blamed on higher wages, fuel and supplies.

• **SPEWING STEEL**—American furnaces are spewing forth steel ingots at a greater rate than ever before in peace time, according to the American Iron & Steel Institute. Total output for the first 9 months was 64,987,478 tons, an increase of 3.6 pct over the 62,705,851 tons for the corresponding period of 1947. Steelmaking furnaces were operated on an average of 92.1 pct of capacity over the first 9 months of this year as compared with an average of 91.9 pct for the same period last year.

• **MORE COMPLAINTS**—Federal Trade Commission has filed complaints against three of the largest soap manufacturing corporations in the country charging them with violation of the Clayton Anti-Trust Act. Containing identical allegations, the complaints charge that each company has discriminated in price by charging certain customers, who are small business men, higher prices than were charged to other, larger, competing customers for soap products of like grade and quality.

• **STAINLESS PRICES**—Carnegie-Illinois' action of Oct. 7 slashing as much as $90 a ton from stainless forging billets is another step toward leveling of stainless prices. The move was to meet lower ARMCO Steel Corp. prices. At press time others had not followed. Sheet and strip prices are almost all competitive now though two producers are still above the rest of the pack. Another month should see competitive prices across the board.

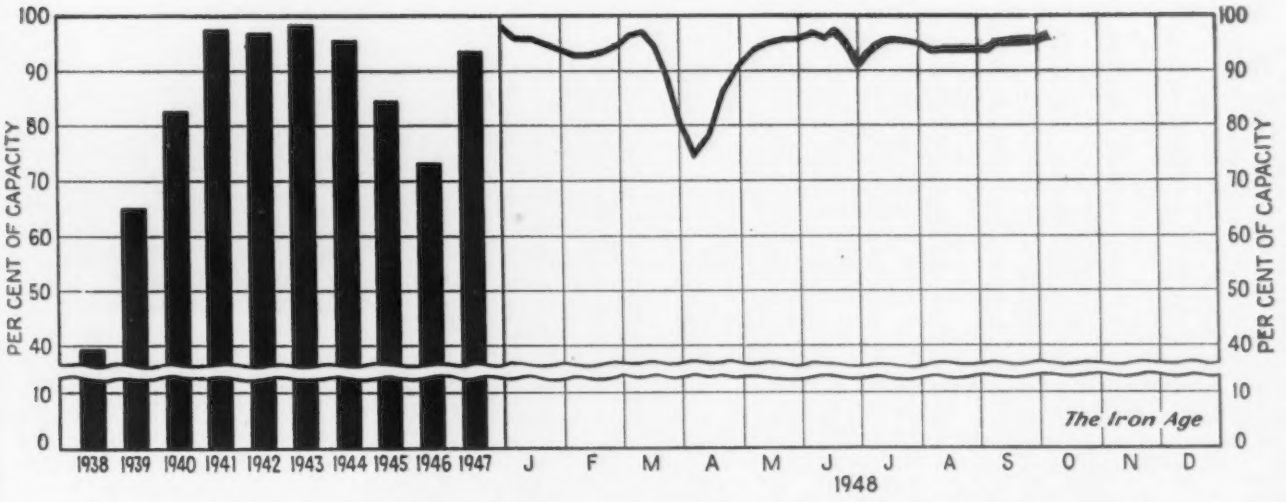
• **HOT-ROLLED EXTRAS**—Following whopping increases in extra charges on hot rolled sheets and strip in Detroit, other steel producers are studying costs on these products. If their costs line up like those of National Steel Corp., which made increases Oct. 1, general advances will follow. Great Lakes and Weirton extra increases on hot-rolled sheets range from $3 to $9 for gage and width; $4 to $7 for pickling; $3 to $7 on length and up to $5 on heat treating. On hot-rolled strip, gage and width extras are up between $8 and $11; $2 to $7 for pickling and $3 to $12 on length. The coil is now the only base on length; cut lengths carry extras.

• **FREIGHT CARS**—Domestic freight car deliveries during September totaled 9753, according to the American Railway Car Institute. Deliveries the first 9 months amounted to 84,176 cars. This is an average of 9350 monthly, compared with 41,176 during the same period last year. Total orders for the year to Oct. 1 were given as 73,718, which compare with 91,087 for the same period in 1947. The total backlog as of Oct. 1 was 108,907 cars, compared with 117,815 a month earlier and 115,996 a year ago.

• **GOING, GOING, GONE**—WAA has turned to the real estate auctioneers for help in unloading the remaining surplus war plants slated for disposal. Auctioneers will be paid commissions and be reimbured for certain expenses. Their cut will be based on a percentage of sale price. Any bid received by an autioneer is subject to approval by WAA before final acceptance. Jesse Larson, WAA administrator believes that the real estate auctioneers are better qualified with their extensive facilities for promotion and market contacts, than is the WAA—hence the new program.

• **SCRAP PLANS**—Seven members of the scrap industry have been picked to draw up plans, including a charter and bylaws, for the proposed private corporation which will buy and return scrap iron and steel from Germany. Those named to the planning group were: Darwin Luntz, R. V. Bonomo, Hiram Winternitz, H. T. Luria, Ralph Ablon, Samuel Keywell, and Stanley Kaplan. When the plan for the corporation has been completed, it must be submitted to the Scrap Industry Advisory Committee as a whole for adoption. It would then go to the Attorney General for approval.

## *Steel Ingot Production by Districts and Per Cent of Capacity*




| Week of | Pittsburgh | Chicago | Youngstown | Philadelphia | Cleveland | Buffalo | Wheeling | South | Detroit | West | Ohio River | St. Louis | East | Aggregate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct. 5 | 99.0 | 99.0* | 93.0 | 87.0 | 98.0* | 105.0 | 96.0 | 102.0 | 99.0* | 90.0 | 107.0 | 91.5 | 112.0 | 97.5 |
| Oct. 12 | 99.5 | 98.0 | 93.0 | 90.0 | 100.0 | 105.0 | 96.5 | 102.0 | 102.0 | 95.5 | 110.0 | 91.5 | 112.0 | 98.5 |

* Revised.

# Memo from our RAW MATERIALS DEPT.

**J&L STEEL**

**JONES & LAUGHLIN STEEL CORPORATION**
OFFICE MEMORANDUM

DATE 8/11/48

TO Metallurgical Dep't.

SUBJECT: Performance of Heat Treated JALLOY Steel at Benson Mines, Star Lake, N. Y.

1" x 6" heat-treated JALLOY #3 flats to reinforce truck-body bottoms and doors. Service--severe impact loading of hard rock magnetite ore from 5-yd. shovel. Year round operations in temperatures to minus 47°F. Severe abrasion in unloading. Installations have been in service 13 months --305,000 tons handled per truck. Units equipped with these flats maintain bottom flatness and clean readily. Insignificant wear at this date indicates at least 2 years life before replacement is necessary.

WHAT better "laboratory" could we find to prove the qualities of J&L Steel than in the equipment required in our own operations?

The handling and moving of heavy, abrasive ore-bearing rock, at our Benson Mines, is a rugged test for any equipment. Yet our stone trucks equipped with heat-treated J&L JALLOY Steel reinforcing strips have run *more than a year* without bottom replacements. *And recent reports indicate at least two years life!*

These JALLOY strips receive the full impact of huge rocks *dropped* into the truck bodies, and withstand the abrasion caused by dumping load after load. This continuous resistance to shock is particularly noteworthy because of the embrittling effect of the sub-zero temperatures encountered during winter months.

J&L JALLOY is a fine-grain, heat-treated steel made in a wide range of physical properties with tensile strengths of 155,000 to 180,000 lbs. per sq. inch. Its inherent ability to withstand shock and abrasion adds life to equipment that must be tough and strong—such as: Rock crushers, Scrapers, Bulldozers, Dump cars, Power-shovel buckets, Truck bodies, Sandblasting equipment—or wherever abrasion and impact are limiting factors.

Manufacturers of trucks and trailers designed for heavy service will find JALLOY an excellent material for body bottoms, reinforcing strips exposed to severe abrasion, tail gates and many other applications. You'll find that JALLOY is a steel that stands up when the going gets tough. For more complete information, let us send you the booklet: "*Jalloy—J&L Alloy Steel.*" It includes data on properties, heat treatments and workability. The coupon at the right is for your convenience.

Jones & Laughlin Steel Corporation
403 Jones & Laughlin Building
Pittsburgh 19, Pennsylvania

Please send me your booklet: "Jalloy—J&L Alloy Steel."

Name _____ Title _____

Address _____

_____

**JONES & LAUGHLIN STEEL CORPORATION**

# Producers Fail to Extend Most Voluntary Allocations Programs

## Army, Air, Atomic Programs Will Be Continued; No Plans On Others After Feb. 28

o o o

By GEORGE F. SULLIVAN
*Pittsburgh Regional Editor*

o o o

*Pittsburgh*

• • • **The steel industry** failed last week to extend voluntary allocations beyond their expiration date, except for direct defense needs. The only programs on the books now that will run beyond the Feb. 28 expiration date are those directly connected with national defense. On these the steel products Industry Advisory Committee had little choice because the draft act permits mandatory allocations for defense steel.

Committee members felt that the number of groups seeking steel under the program was becoming so large as to threaten the national economy. Commerce dept. officials agreed. Steel companies are glad to furnish steel for atomic energy, military orders and other groups whose part in national defense is clear. They need no compulsion to do so.

If most steel executives had their way they would toss voluntary allocations out the window. Or, to keep up appearances, they'd restrict them to essential defense needs—which they would meet anyhow, controls or not. They may not have their way. They may have to revive the whole program of non-military allocations to forestall mandatory allocations. There are Congressmen of both parties who will be plugging for such controls next year.

**In practice,** a program that started off slowly with freight car steel snowballed to the point where, for example, a third of plate production was earmarked and approval of requests under consideration in Washington would have shot this to perhaps 50 pct of plate output.

"How," said one committee member, "can we, a small group, sit down and draw plans to strangle various sections of the national economy." As each new program was approved, other steel consumers were cut. Many of these people naturally formed industry groups to descend on Washington to demand allocations of their own.

And as each new allocation was approved, substantial tonnages were taken away from other steel users. The industry was not told what customers to cut. But as each customer saw his quota cut his anger was directed not at Washington but at the steel producers. They prefer to have no part in such cuts unless they can definitely tell their screaming customers that the steel is going for defense.

Few care to say which of the programs now on the books are essential to defense and which are not. The steel industry group has had to pass on one program that was questionable in the minds of a majority. They turned it down but were forced by government pressure to reconsider.

Another reason given for making no promises beyond February was that programs now in effect should be reconsidered at that time. The industry wants to screen carefully all programs before embarking on another round that may wind up like the present one. Programs termed essential some months ago may not be so considered a few months hence.

**The industry group,** despite a

"VOLUNTARY" ALLOCATIONS

## Four Programs Rejected, Four Postponed

*Washington*

**• • • Emphasizing their willingness to continue voluntary allocations of steel products to any programs having a bearing on national defense, members of the Steel Products Industry Advisory Committee last week rejected requests for various civilian programs calling for an additional monthly allocation of 29,755 tons of steel products and deferred action on programs requiring 119,800 tons monthly.**

**Only one new program was accepted. This calls for the voluntary allocation of 10,000 tons of steel products monthly during January and February 1949 to the shipbuilding industry. While the tonnage involved is relatively small, about 85 pct of the total is plate—already in very tight supply.**

**Also rejected were requests for 5000 tons more steel monthly to the barge industry and 2500 tons more sheet monthly for the warm air heating industry.**

**The four new plans rejected were: (1) 12,000 tons monthly for farm and home storage tanks; (2) 855 tons monthly for steel baseboard radiation; (3) 4100 tons monthly for steel doors and bucks; (4) 5300 tons monthly for pressed steel plumbing fixtures.**

**The following four plans were postponed pending further study: (1) 16,000 tons monthly for terminal and bulk oil storage tanks; (2) 31,000 tons monthly for bituminous coal mines; (3) 47,800 tons monthly for mining machinery; (4) 25,000 tons of 22-in. line pipe for the East Tennessee Natural Gas Pipe Line.**

desire on the part of many members to abandon the entire voluntary program, will hold itself open for reconsideration. But its members apparently feel that they cannot make promises in October that will be binding on them next March. Many things may change by then.

One program that may change is the original one—freight car steel. Intelligent self-interest demands that steel companies supply steel for building new cars and repairing old ones. But no one knows today how much steel will be needed for new freight cars next March. On the basis of the orders now on the books in some freight car shops there will be practically no business for them in March.

The railroads ordered only 845 cars in September, a postwar low. Unless their orders pick up substantially this month the carbuilders will not need the steel for 10,000 cars in March. This was cited as just one example of why the steel industry products advisory committee refused to commit itself beyond the expiration of the present law.

## U S. Steel Agreeable To Consent Decree In Pittsburgh Plus Case

*Philadelphia*

**• • • Dropping its** long legal battle, U. S. Steel Corp., last week consented to entry by the Third Circuit Court of Appeals of a decree enforcing an order issued by the Federal Trade Commission a quarter of a century ago. The consent decree affirms and enforces an order directing the U. S. Steel Corp. and its subsidiaries to discontinue use of the Pittsburgh-Plus basing point system, or any similar system by which price quotations are based on a basing point other than that where the products are manufactured or shipped.

The consent decree also requires a report of compliance to be filed with the commission within 60 days. The decree was entered in accordance with a stipulation between counsel for the steel corporations and for the commission consenting to its issuance without any further proceedings. On the day the decree was entered, the case was to have been argued before the court.

In a statement, U. S. Steel Corp. explained that last year the FTC began a case against about 100 steel companies using the multiple basing point method of selling. That system was abandoned recently by the corporation after FTC won a similar fight against the cement industry.

"The FTC's new case should ultimately determine by what competitive methods steel should be sold by members of the steel industry.

"U. S. Steel has consented to this decree of affirmance believing that the court should not be called upon to review a voluminous record taken at hearings held over 25 years ago for the purpose of deciding a question which has become academic."

## Not For All

*Pittsburgh*

**• • • Although U. S. Steel Corp. agreed to a consent decree in the "Pittsburgh Plus" case because the matter is now academic it would not be academic for other steel producers. The court did not hear evidence in the case. If another steel company elected to return to the "Pittsburgh Plus" pricing system—and several of them used it just prior to the recent changeover to f.o.b. selling—the FTC would have to go to court if it wanted to enforce its policy. The case does not ban "Pittsburgh Plus" steel selling, except as far as U. S. Steel Corp. subsidiaries are concerned.**

## Offers $5 Million For A Government-Owned Plant

*Philadelphia*

**• • • Budd Co. has offered** a high bid of $5 million for the government-owned factory and airfield at Bustlefield, according to John L. Moore, regional WAA director.

Moore has recommended to Washington that the bid be approved by national headquarters of the surplus disposal agency and the Justice Dept. which must pass on sales which exceed $1 million.

The proposed sale is subject to the security clause which provides that the property be made available to the government in the case of a national emergency.

Since V-J Day, Budd has been operating the plant for the government at an annual rental rate of $754,960. In addition, the company has spent more than $800,000 in improvements.

# Warehouses Brewing Stormy Reaction Over Discount Elimination

## Some Have Cancelled All Mill Orders for Stainless Steel Products

o o o

By JOHN ANTHONY
*Eastern Regional Editor*

o o o

*Philadelphia*

• • • **Steel warehouses,** cut off from the 10 pct distributors' discount for stainless steel products by all major producers, are fighting mad over what they say is the most serious development in warehouse history.

Some independents believe that it would be impossible for them to continue to warehouse stainless steel and make a profit under the mills' new sales policy. Some warehouses have already taken action that could create chaos in the stainless market if followed generally. They have cancelled all their outstanding orders for stainless from major producers, and are selling out their stainless inventories at the former lower prices.

The sales at the lower prices are made necessary they say because of the growing resistance of buyers to the new higher prices that hit hardest in the light gages and small orders that constitute the largest proportion of warehouse orders for stainless steel.

An indication of the effect of the new mill sales policy on warehouse operations is gained by a recalculation of their stainless operations during the past 6 to 8 months made by a number of independents. This showed that the gross profit dropped under the new prices and extras but without benefit of the discount to an average of 6½ pct from the average of 17 pct based on experience. These figures have been checked by a number of warehouses in the country who report them to be reasonably close to their own findings.

**The gross profit** figure of 17 pct formerly realized by warehouses on stainless sales is reported to be below that realized from sales of carbon and alloy steels. These products are not sold on a distributors' discount but a warehouse markup is applied to them.

The new mill schedules of stainless base and quantity extras have been adjusted to provide a margin for warehouses to live off the differences in extras for warehouse and customer order quantities. But warehouses say that on products of such high and varying costs, their return would be inadequate to permit them to continue to handle the products.

For example, on one type of sheet, AISI 302, there is a price range of 40¢ to $1.03 per lb, varying with gage numbers from 11 to 26 and whether polished or unpolished. Other grades range much higher in price, and the warehouses believe that only a percentage based on valuation of the steel would be acceptable for their compensation. The differences in quantity extras do not vary with the value of the grades or gages.

The mills have lowered the base quantity for stainless steels to 10,000 lb from 40,000 lb. This base, however, applies to a single item of size, gage, grade, etc., deliverable to one location. One typical warehouse carries 162 items of stainless sheet alone. They point out that an initial stock of the base quantity for most of these sheet items would involve 700 to 800 tons of stainless at a conservatively estimated cost of $750,000. No independent warehouse could afford to put in more than a few of the fastest moving items in such tonnages. Although quick turnover is the basis for the industry's operations, they say it would take 3 years to turn over stocks of 10,000 lb.

**The decision to** abandon the warehousing of stainless steels is not taken lightly by steel distributors, whose dollar volume of stainless inventory may range from 25 pct to 50 pct of total inventory. The loss of this market could easily mean the difference between solvency and insolvency for the warehouses.

Shipments of cold-rolled stainless sheets to warehouses have been running over 47 pct of total mill production. Hot-rolled shipments are somewhat lower at 18 pct Shipments of bars to warehouses have been ranging from 21 pct to 23 pct. Warehouse participation in the strip market is negligible. Warehouse shipments of stainless pressure tubing constitutes 46 pct of total mill production.

The effect of the new price schedules on consumers is a major warehouse consideration. Customers are said to have begun to buy surplus stocks of stainless and are having it polished commercially. Consumers, who have never carried large inventories of stainless steel because it has usually been readily available from the warehouses, have begun to recognize that from now on they won't be able to obtain their requirements readily from well balanced warehouse stocks. Under these circumstances, and in view of the tremendous increase in costs represented by quantity extras and others, especially polishing extras for the light gages, customers have already begun to study the prospects of substituting plated carbon steels, plastics or other materials. Many of the small and medium consumers will be forced out of the market by the costs of the extras alone, in the view of distributors.

Independent warehouses believe that there may be greater possibility of warehouses that operate a number of branches buying in base quantities and reshipping. However, it is learned that such warehouses are not happy over the development, although it may come to mean that they will exercise a virtual monopoly over the warehouse distribution of stainless steels. There is no probability of the dropping of stainless by the mill subsidiary warehouses.

**Some of the** smaller producers of stainless sheets still have not dropped the discount to distributors. Recent information indicates that

### Gray Market Report

**• • • Most important result of Macy committee to investigate questionable trade practices is an agreement with eight major steel producers to attempt to supply steel to manufacturers who report their gray market sources. For a digest of the report of this committee see Washington column, p. 164—Editor.**

# Industrial Briefs . . .

• GRANTS LICENSE — Link-Belt Co., Chicago, has announced the appointment of Nortons-Tividale, Ltd., of Tividale, Tipton in Staffordshire, England, as exclusive vendors and manufacturers in the United Kingdom of the Link-Belt float-sink concentrator, which is an original development in equipment for use in connection with the heavy media process of cleaning coal and concentrating minerals.

• ACQUIRES INTEREST — Sears, Roebuck & Co., Chicago, has announced the purchase of a substantial stock interest in Kaiser Fleetwing, Inc., Bristol, Pa. The Bristol plant, which is now turning out aluminum and steel products for the Kaiser enterprises, will be expanded for the production of porcelain enamel steel sanitary equipment exclusively for Sears.

• WESTERN OUTLET—J. H. Williams & Co., Buffalo, manufacturer of drop-forged tools, has announced the opening of a warehouse and sales office in Los Angeles. Charles F. Coates has been named western district manager.

• BUYS GENERATOR—The Westinghouse Electric Corp., Pittsburgh, has reported that it will build a 65,000-kw turbine generator for the Texas Electric Service Co. The generator will be installed in the Fort Worth, Tex., area and will be produced by Westinghouse plants in south Philadelphia and east Pittsburgh.

• AMPCO DISTRIBUTORS—Three additional distributor outlets have been announced by Ampco Metal, Inc., Milwaukee. They are Welding Engineering Sales Corp., Buffalo and Syracuse; Southern Oxygen Co., Inc., Knoxville, Tenn.; and Arizona Welding Equipment Co., Phoenix, Ariz.

• NEW HEADQUARTERS — New executive headquarters from which will be directed the nationwide activities of the National Cylinder Gas Co. have been established in the seven-story building at 840 North Michigan Ave., Chicago, recently purchased by the firm.

• WEEKLY PLANT TOURS—The Tennessee Coal, Iron & Railroad Co., Birmingham, has announced a weekly plant visitation program at its Fairfield Steel Works. Transportation through the plant area will be provided by company-chartered buses 2 days a week.

• PLANT EXPANSION—Another expansion program has been announced by Kennametal Inc., Latrobe, Pa., involving an expenditure of over $200,000. A new building will be erected at the rear of the property and an addition made to the laboratory.

• ACQUISITION — Wallace F. Ardussi, sales and engineering executive, has purchased the Variety Machine & Stamping Co., Cleveland. The company has been operating as a high production manufacturer of metal stampings, assemblies, and tools and dies.

• WEST COAST OFFICE—Jack & Heintz Precision Industries, Inc., Cleveland, has opened a branch office in Los Angeles. P. R. Baus has been appointed manager of the new office which is located at 409 Hollywood Professional Bldg., Hollywood Blvd., Hollywood, Calif.

• INSTRUMENT DEALERS—W. & L. E. Gurley, Troy, N. Y., manufacturer of engineering and scientific instruments, has announced the appointment of three new dealers, L. L. Ridgway Co., 324 Lafayette St., will be agent for New York; Western Blueprint Co., Kansas City, for Kansas and western Missouri; and Wray Williams Co., Memphis, for Tennessee and Arkansas.

they do not now intend to take such action. However, since some of these producers are not integrated, depending on major producers for their sheet bar, it is possible that they may yet be forced into line. Right now, however, these producers are being flooded with orders from warehouses. Their prices are still on a 10 pct higher basis which means they are appreciably lower than those of the major producers in the sheet gages which constitute the bulk of the market.

Mills and warehouses ordinarily sell stainless steels on the same price schedules. One reason that caused the mills to drop the distributors' discount is to prevent warehouse undercutting of mill stainless steel prices under the impetus of a competitive market.

## Belgium Consumes More Scrap Than In Prewar

*Brussels*

• • • **Despite improvement** in postwar coke supply which would normally permit use of more iron ore in steel manufacture, the Belgian iron and steel industry continues to consume a higher percentage of scrap than it did in the prewar period.

During the month of August steel production ran 350,000 metric tons for which about 140,000 tons of scrap was used.

Recently the market showed signs of weakness but prices held in line with current quotations:

| | Belgian Francs |
|---|---|
| **IRON SCRAP** | |
| Ingot molds, broken | 3000 |
| Ingot molds, unbroken | 2500 |
| Machinery Cast, No. 1, broken | 2600 |
| Machinery Cast, No. 1, unbroken | 2100 |
| Stove Plates | 2000 |
| **STEEL SCRAP** | |
| No. 1 Heavy Melting | 1500 |
| Blast Furnace Scrap | 1600 |
| Turnings, short | 1400 |
| Rails, all lengths | 1800 to 1900 |
| Electric furnace specialties | 1700 |

## To Open Belgian Office

*New York*

• • • **Mr. John R. Van Winkle**, treasurer of Chas. Williams & Associates, Ltd., 50 Church St., New York, exporters of heavy steel products and machinery, has left for Europe to open a buying office in Antwerp, with a branch office in Birmingham, England.

While in Europe, Mr. Van Winkle will interview steelmakers in Belgium, Luxembourg, France and England.

CANADIAN DAY: *AISC's convention at Chateau Frontenac, Quebec was attended by, left to right, G. E. Treloar, president Canadian Institute of Steel Construction; Hon. J. Robinson, minister of mines, Province of Quebec; T. R. Mullen, retiring president American Institute of Steel Construction; N. R. Patterson, president elect, American Institute of Steel Construction; Allan Ross, president Canadian Assn. of Construction.*

# Steel Construction Men Talk Hard Facts at Quebec Convention

## World Walking on Eggs Feeling Pervades Annual Meeting of Structural Men

o o o

By TOM CAMPBELL
*News-Markets Editor*

o o o

*Quebec*

• • • **The ghost of** war—hot or cold—stalks men wherever they meet. It was looking over the shoulders of those attending the annual meeting of the American Institute of Steel Construction held at Chateau Frontenac here last week.

No matter what the conversation, there was that uneasy feeling of the world walking on eggs—that sooner or later we might stop talking about peace and the stabilized dreamworld.

But tough-minded Tom Mullen, AISC president, promised that his individualistic group would take little or no time converting for war. He hoped there would be no war. But the fun-loving structural steel boys could be dead serious on a moment's notice. A flip of the switch and they would, he said, get into line fast.

Tom Mullen, who privately helps run Lehigh Structural Steel, tossed a few more hard kernels for the boys to chew on. The organization has grown up he said. He made it plain that the toys should be put away. And he himself was an example of what he was talking about.

He planted the idea that if the public did not know much about the structural steel industry it was the group's fault. Now was the time to get the lead out and tell the story. If the fabricating industry were to give up the title of *The Forgotten Man* with the public, a vigorous sense of responsibility by the group was a must, Tom Mullen said.

**In the corridors** of Chateau Frontenac the steel talk was the same, or worse, than a year ago. Steel men were hoping that there would be a little more steel next year—but they pulled long faces when they said that. Fabricators—with self-induced control—wagged their heads. As far as they could see they would get about 10 to 20 pct less steel in the first quarter of next year than they are getting this year.

But the battered steel industry appears to have done a good job of explaining to the steel fabricators. Criticism was mild. And there was an understanding of problems—but this "good" attitude might wear itself out by next year.

The structural steel timetable on immediate jobs is still about 10 weeks and runs 2 to 3 weeks late on completion. On large projects the lag is about 1 month on an original promise of 4 months. It all depends on whom you tag to get this dope. Maybe the whole thing should have a few weeks or months added to it. But one thing stands out. Behind all of the essential work being turned out is a mountain of other work in the potential backlog stage.

Municipal requirements for years to come will be heavy. No one can get to it. Schools will be high on the list when they can get anyone to bid on the jobs. And even churches have fallen far behind compared with the amount of work that must be done. But most of this tonnage is in the future.

As a structural man tells you how much business there is and how much is coming he usually looks as if he had bitten into a quince. For some reason or other, during the past 3 years industrialists have expected the worst

while the barometer went higher.

**This is about** the place to bring in Jack Singleton, AISC chief engineer, who gave the boys hell for their obsolete plant. He laid it on the line. When competition really sets in, he hinted, many of the members will be caught short with plants that cannot stand the rat race.

Now is the time to rebuild, add and replace machinery, he said. If you wait too long the fellow who uses a few gambles and imagination will get the job—that is when price rears its ugly head again. And Engineer Singleton stuck his neck out and said that time may be only 2 years away. He might be wrong about the time but he was certain his message would stand pat.

Thanks to good planning and robust cooperation of Canadians, AISC members (now representing 225 companies) had plenty to chew on. They got the real low-down on the now famous Quebec-Labrador iron ore project. And they heard it straight from Jonathan Robinson, Provincial Minister of Mines. Before a ton of ore is mined about $300 million must be spent for railroad, village, equipment, etc.

The Canadians are not napping either. Unless the project gets started on or before 1958 it will be bad for the company which has the lease. Picked for the job was Hollinger North Shore Exploration Co. working in close harmony with Hanna Co. of Cleveland. The minister claimed that known reserves now total 300 million tons of high grade hematite. Unofficial figures put it as high as a billion tons.

**The Kennecott ore** development (THE IRON AGE, Sept, 2, p. 125) is coming along. Over $1 million has been spent already in building a 27-mile railroad. Preliminary development of this titanium bearing iron ore field will cost about $30 million.

The Dominion Bridge Co. has the contract for the first bridge on the 27-mile railroad to the titanium-iron ore project. Robert S. Eadie, chief engineer of the Canadian company, said that steel output in the Dominion is running about 3 million tons a year. The United States is the sole source for additional steel. None is coming from Great Britain, Belgium or Luxembourg Mr. Eadie said.

David Austin, president of the U. S. Steel Corp., told the group that more scrap from Germany and Japan is needed to ease the drastic shortage of steel. He added that steel producing capacity has been increased 15 pct since 1939 and that the proposed expansion program will cost in the neighborhood of $1.6 billion. Of this amount, about $565 million will be spent this year.

Each month since V-J Day the industry's backlog of unfilled orders has been the equivalent of 6-months' operation of the mills at full capacity. Yet with the present expansion program, it will take at least 2½ to 3 years to increase capacity another 10 pct.

An attempt to put American business in the straitjacket was charged by Wilferd Sykes, president of Inland Steel Co. "If we were to take the decision [Supreme Court decision on the Cement Case] literally," he added, "the post office would have to vary postage rates for every different point in the United States and could not operate its present zone rates for parcel post." Mr. Sykes also predicted that Congress would have to clarify the law in order that a free competitive market may be maintained.

## New Officers

*Quebec*

• • • **N. R. Patterson has been elected president of the American Institute of Steel Construction at the closing session of the institute's 26th annual convention. He has been president of the Patterson Steel Co., Tulsa, since 1932 after having previously served as vice-president since 1921.**

N. R. Patterson

**Other elected officers include: R. D. Wood, Chicago, first vice-president; J. Philip Murray, San Francisco, second vice-president; John E. Jackson, Pittsburgh, treasurer; L. Abbett Post, executive vice-president and M. Harvey Smedley, secretary, both of New York. B. E. Bushnell, Jacksonville, Fla., was elected to the board of directors.**

## AISE Sets 1949 Dates

*Pittsburgh*

• • • **Pittsburgh will be the scene** of the 1949 annual convention of the Assn. of Iron & Steel Engineers. It is scheduled for Oct. 3-6 in the William Penn Hotel.

No exposition will be held in conjunction with the 1949 meeting in conformance with the association's recently adopted policy of holding the expositions on an every-other-year basis. The AISE spring meeting will be held May 2 and 3 in Baltimore.

## Coming Events

**Oct. 18-20** National Metal Trades Assn., annual convention, New York.
**Oct. 18-22** National Safety Congress and Exposition, Chicago.
**Oct. 20-21** National Conference on Industrial Hydraulics, annual meeting, Chicago.
**Oct. 22-25** Metal Treating Institute, annual meeting, Philadelphia.
**Oct. 23-29** American Society for Metals, annual convention, Philadelphia.
**Oct. 24-29** American Welding Society, annual meeting, Philadelphia.
**Oct. 25-27** American Institute of Mining and Metallurgical Engineers, Metals Div., fall meeting, Philadelphia.
**Oct. 25-27** American Gear Manufacturers Assn., fall meeting, Chicago.
**Oct. 25-29** National Metal Exposition, Philadelphia.
**Oct. 27-28** Society for Nondestructive Testing, annual convention, Philadelphia.
**Nov. 4-6** National Electronics Conference, Chicago.
**Nov. 14-17** National Tool & Die Manufacturers Assn., annual meeting, Milwaukee.
**Nov. 18-19** National Founders Assn., annual meeting, Chicago.
**Dec. 2-4** Society for Experimental Stress Analysis, annual meeting, New York.
**Dec. 6-8** Electric Welding Conference, Detroit.

# SKF's Hornell Plant Serves As Labor Relations Proving Ground

## Progressive Company, Union Techniques Could Form New Pattern for Industry

By STEVE SMOKE
*Associate Editor*

*Hornell, N. Y.*

• • • **When a company** and a union work together—they've got something. And that's just what SKF and Maple City Lodge 1684 of the International Assn. of Machinists are doing here at Hornell.

They have the highest regard for each other. That's important. But so many other progressive techniques employed by both groups make labor-management relations here a real proving ground for the entire country's industry.

To begin with, there is complete understanding between Myron Caylor, manager of the SKF plant, and Bill Jackson, president of the local. Caylor and other officials of SKF have accepted IAM as the workers' bargaining agency right from the start. Bill Jackson and Frank Wolfanger, on the other hand, have done everything they could to cooperate with SKF to the fullest extent. Both groups know that they have to get along—and that they do beyond a doubt.

Contract negotiations between SKF and IAM were an unusual experiment in labor-management relations. They were conducted on the highest level of cooperation and understanding.

During the course of negotiations, each of the plant foremen was given an opportunity to sit in on at least one of the meetings between representatives of the company and the union. This gave the foremen a first-hand chance to see just how the negotiations were carried out, to understand more clearly provisions of the contract, and to realize the importance of the role they play in labor relations today.

**After the** agreement was signed, company negotiators called the foremen together and explained in detail the meaning of the various contract provisions. This was all designed to clarify the foreman's duties connected with the contract and to emphasize their managerial responsibilities.

But this was not all. To further typify the spirit with which the company had entered into the negotiations with the union, SKF threw a dinner party at the local country club for all the union and company negotiators and foremen. This naturally served to further cement relations between the two groups.

An unusual provision of the contract is that which provides for a monthly meeting of the company and the union to discuss settlement of differences (grievances) or any other business of interest to either group. Foremen and union committeemen (shop stewards) are an integral part of these meetings.

Such an approach indicates how clearly SKF and Local 1684 realize that understanding and cooperation between foremen and committeemen is essential. No matter how good a contract may be negotiated, it is these men who work side by side who will either make or break a contract when it comes to making it work.

It is significant that to date there have been no differences to settle.

Union activity here, too, is exceptional. The local has two meetings monthly. At these meetings committeemen are instructed how to perform their duties and be of a service both to the men and the company. To indicate the cooperation that exists and the responsibility for its members that the union assumes, IAM has requested that before the company takes any action against a worker who is not doing his job, they refer his name to the union for its action. If the union cannot straighten the worker out, then the company pursues its course of action.

**Furthermore, the union** is selective in its choice of committeemen. They insist on only the best of personnel. In fact, at the recent election two names were stricken from the list of eligible candidates as being unqualified for such a position.

Recently SKF had a family day with open house at the plant and a picnic for its employees and their families at nearby Stony Brook State Park. Some $1200 was spent on the affair with almost $500 being given to the workers and kiddies in contest prizes. Union officials and members worked hand in hand with the company in preparing for the affair and contributed their time where necessary to make it a success.

SKF feels that these affairs are important to employee morale. In addition to this the company had a softball team in the local city league and will have basketball teams this winter to provide recreation and entertainment for the workers.

Although wages are a bone of contention between most labor-management groups throughout the country, this matter has been handled quite satisfactorily so

### Background

**• • • SKF Industries, Inc. opened a new plant at Hornell, N. Y., in September 1947.**

**Shortly after operations got under way, Frank Wolfanger, president of the Erie R. R. International Assn. of Machinists, told Myron Caylor, manager of the SKF plant, that he would be around to organize the workers after the plant got its feet on the ground. But that if any other union tried to break in beforehand, he would have to start in right away.**

**To this remark Caylor was reputed to have answered, "O.K. Frank, I'll be looking for you."**

**Well the CIO did try to get in, so Frank Wolfanger went to work and IAM won out. The agreement between SKF and IAM became effective on July 5, 1948.**

**How the contract was negotiated and how SKF and IAM work together is novel.**

far. The scale agreed upon is that of the prevailing wage rate in the territory based on the standard of living costs in the locality.

**Union officials** stated that in determining what their wage requests would be, they had not considered wages for corresponding jobs in other parts of the country. What interests them most is their own livelihood and their own problems. Rightfully so—they may be setting a pattern which will give labor just the right twist to make its presence in industry not only acceptable but desirable to management.

Everything could go haywire overnight here at Hornell. It has before between other groups. But instead, chances are far better that the pattern for these relations will broaden and possibly have far-reaching effects.

Here there is no line of demarcation between the two groups other than in name. SKF has already invested about $1.7 million in this plant and William Batt, president of the firm, has told the employees "the future of this plant lies in your hands."

About this Frank Wolfanger said for the union, "We want SKF to stay in Hornell; we want it to grow and we are going to do everything we can to help."

## Plans Norway Meeting

*London*

• • • **The British** Iron and Steel Institute expects to hold its summer meeting next year in Norway. It has received an invitation from the Norsk Metallurgisk Selskap (Norwegian Metallurgical Society). It is hoped to arrange for the meeting to take place between May 28 and June 7, 1949.

## Mexican Steel Credit

*Washington*

**• • • The Board of Directors of Export-Import Bank of Washington has authorized credit of $1,500,000 in favor of Nacional Financiera, S. A., a financial agency of the Mexican Government, to enable it to provide financing required by La Consolidada, S. A., a Mexican steel company.**

**The credit, which will be guaranteed by the United Mexican States, will be amortized over a term of 5 years.**

**La Consolidada is one of three major producers in the Mexican steel industry whose operations are conducted by the installation of a new rolling mill outside of Mexico City and an additional openhearth furnace at Piedras Negras in Northern Mexico in order that it be in a better position to serve the growing needs of an increasingly industrialized Mexican economy.**

### AMERICAN IRON AND STEEL INSTITUTE
### SHIPMENTS OF STEEL PRODUCTS
### ALL GRADES INCLUDING ALLOY AND STAINLESS
### (Net Tons)

AUGUST - 1948 (Month)

| Steel Products | Number of companies | Items | Current Month: Net Shipments (Excluding Shipments to Members of the Industry for Conversion into Further Finished Products or For Resale) (Net Tons) | Current Month: Per cent of Total Shipments | Current Month: Shipments to Members of the Industry for Conversion into Further Finished Products or For Resale (Net Tons) | To Date This Year: Net Shipments (Excluding Shipments to Members of the Industry for Conversion into Further Finished Products or For Resale) (Net Tons) | To Date This Year: Per cent of Total Shipments | To Date This Year: Shipments to Members of the Industry for Conversion into Further Finished Products or For Resale (Net Tons) | Whole Year 1947: Net Shipments (Excluding Shipments to Members of the Industry for Conversion into Further Finished Products or For Resale) (Net Tons) | Whole Year 1947: Per cent of Total Shipments | Whole Year 1947: Shipments to Members of the Industry for Conversion into Further Finished Products or For Resale (Net Tons) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingots, blooms, billets, tube rounds, sheet and tin bars, etc. | 45 | 1 | 238,903 | 4.5 | 288,151 | *2,011,412 | 4.7 | *2,148,598 | 2,966,748 | 4.7 | 2,396,343 |
| Structural shapes (heavy) | 12 | 2 | 336,446 | 6.3 | 1,676 | 2,767,919 | 6.5 | 17,097 | 4,436,129 | 7.0 | 2,640 |
| Steel piling | 4 | 3 | 26,146 | 0.5 | 23 | 196,305 | 0.5 | 1,106 | 324,224 | 0.5 | 23 |
| Plates (sheared and universal) | 29 | 4 | 553,089 | 10.4 | 29,546 | 4,499,525 | 10.5 | 249,659 | 6,345,216 | 10.1 | 219,227 |
| Skelp | 6 | 5 | 16,516 | 0.3 | 48,374 | 100,287 | 0.2 | 284,815 | 160,989 | 0.3 | 384,004 |
| Rails—Standard (over 60 lbs.) | 4 | 6 | 164,413 | 3.1 | 1,294 | 1,290,552 | 3.0 | 8,521 | 2,207,146 | 3.5 | 991 |
| —All other | 5 | 7 | 13,457 | 0.3 | 79 | 146,968 | 0.3 | 922 | 211,900 | 0.3 | 329 |
| Joint bars | 7 | 8 | 10,838 | 0.2 | 3,805 | 91,618 | 0.2 | 26,661 | 173,923 | 0.3 | 15,198 |
| Tie plates | 7 | 9 | 42,188 | 0.8 | 52 | 330,518 | 0.8 | 322 | 504,779 | 0.8 | 4,437 |
| Track spikes | 8 | 10 | 11,690 | 0.2 | 175 | 92,596 | 0.2 | 524 | 163,746 | 0.3 | 146 |
| Hot Rolled Bars—Carbon | 34 | 11 | 480,076 | 9.0 | 54,410 | 4,047,024 | 9.5 | 408,969 | 6,242,416 | 9.9 | 745,770 |
| —Reinforcing—New billet | 16 | 12 | 101,025 | 1.9 | 566 | 875,938 | 2.0 | 4,552 | 1,277,075 | 2.0 | 9,775 |
| —Rerolled | 13 | 13 | 19,253 | 0.4 | - | 140,098 | 0.3 | - | 175,833 | 0.3 | - |
| —Alloy | 27 | 14 | 155,617 | 2.9 | 17,299 | 1,230,849 | 2.9 | 150,689 | 1,741,432 | 2.8 | 212,382 |
| —TOTAL | 44 | 15 | 755,971 | 14.2 | 72,275 | 6,293,909 | 14.7 | 564,210 | 9,436,756 | 15.0 | 967,927 |
| Cold Finished Bars—Carbon | 28 | 16 | 109,868 | 2.1 | 744 | 864,917 | 2.0 | 4,212 | 1,426,701 | 2.3 | 9,249 |
| —Alloy | 27 | 17 | 21,444 | 0.4 | 554 | 147,303 | 0.4 | 4,507 | 218,802 | 0.3 | 2,601 |
| —TOTAL | 35 | 18 | 131,312 | 2.5 | 1,298 | 1,012,220 | 2.4 | 8,719 | 1,645,503 | 2.6 | 11,850 |
| Tool steel bars | 18 | 19 | 8,005 | 0.2 | 187 | 56,869 | 0.1 | 1,295 | 87,279 | 0.1 | 1,670 |
| Pipe & Tubes—Butt weld | 15 | 20 | 165,708 | 3.1 | 2,663 | 1,293,357 | 3.0 | 17,858 | 1,892,691 | 3.0 | 78,080 |
| —Lap weld | 8 | 21 | 26,736 | 0.5 | - | 222,789 | 0.5 | 3 | 389,762 | 0.6 | 875 |
| —Electric weld | 13 | 22 | 139,720 | 2.6 | 310 | 1,004,399 | 2.4 | 3,274 | 1,254,325 | 2.0 | 4,274 |
| —Seamless | 17 | 23 | 230,680 | 4.3 | 11,102 | 1,889,100 | 4.4 | 110,417 | 2,581,106 | 4.1 | 157,208 |
| Wire rods | 20 | 24 | 40,583 | 0.8 | 30,305 | 403,490 | 1.0 | 208,202 | 667,282 | 1.1 | 331,192 |
| Wire—Drawn | 39 | 25 | 213,449 | 4.0 | 14,499 | 1,736,360 | 4.1 | 116,906 | 2,590,963 | 4.1 | 181,783 |
| —Nails and staples | 17 | 26 | 72,465 | 1.4 | 1,086 | 566,958 | 1.3 | 8,863 | 799,436 | 1.3 | 8,481 |
| —Barbed and twisted | 15 | 27 | 19,725 | 0.4 | 305 | 168,903 | 0.4 | 399 | 256,991 | 0.4 | 128 |
| —Woven wire fence | 13 | 28 | 32,951 | 0.6 | 260 | 264,827 | 0.6 | 2,399 | 407,295 | 0.6 | 3,616 |
| —Bale ties | 11 | 29 | 9,500 | 0.2 | - | 80,266 | 0.2 | - | 119,917 | 0.2 | - |
| Black Plate—Ordinary | 9 | 30 | 63,574 | 1.2 | - | 528,676 | 1.2 | 654 | 801,745 | 1.3 | 2,033 |
| —Chemically treated | 2 | 31 | 810 | - | - | 9,505 | - | - | 19,252 | - | - |
| Tin and Terne Plate—Hot dipped | 8 | 32 | 194,175 | 3.6 | 16 | 1,392,860 | 3.3 | 210 | 2,093,149 | 3.3 | 228 |
| —Electrolytic | 9 | 33 | 148,920 | 2.8 | - | 1,160,200 | 2.7 | 215 | 1,617,659 | 2.6 | 529 |
| Sheets—Hot rolled | 32 | 34 | 634,570 | 11.9 | 49,915 | 5,082,284 | 11.9 | 422,430 | 7,891,798 | 12.5 | 578,426 |
| —Cold rolled | 16 | 35 | 555,708 | 10.4 | 2,411 | 4,424,241 | 10.4 | 13,794 | 5,504,578 | 8.7 | 28,498 |
| —Galvanized | 16 | 36 | 137,654 | 2.6 | 272 | 1,073,318 | 2.5 | 1,981 | 1,609,881 | 2.5 | 889 |
| Strip—Hot rolled | 23 | 37 | 130,186 | 2.4 | 29,019 | 1,079,476 | 2.5 | 231,629 | 1,740,085 | 2.7 | 308,655 |
| —Cold rolled | 34 | 38 | 156,424 | 2.9 | 2,145 | 1,151,547 | 2.7 | 16,175 | 1,613,005 | 2.6 | 28,030 |
| Wheels (car, rolled steel) | 5 | 39 | 28,451 | 0.5 | 68 | 217,115 | 0.5 | 726 | 356,873 | 0.6 | 2 |
| Axles | 5 | 40 | 18,097 | 0.3 | 6 | 136,606 | 0.3 | 103 | 185,019 | 0.3 | 53 |
| All other | - | 41 | - | - | - | - | - | - | - | - | - |
| TOTAL STEEL PRODUCTS | 140 | 42 | 5,329,060 | 100.0 | 591,317 | *42,776,975 | 100.00 | *4,468,687 | 63,057,150 | 100.0 | 5,717,765 |

During 1947 the companies included above represented 99.5 % of the total output of finished rolled steel products as reported to the American Iron and Steel Institute.

* Adjusted.

# Weekly Gallup Polls . . .

## New England and Middle Atlantic States Poll Favors GOP

*Princeton, N. J.*

• • • **In the six states** of New England and the six states of the Middle Atlantic section Gov. Thomas E. Dewey leads today in a total of 11, while President Truman is ahead in one—Rhode Island, according to George Gallup, director, American Institute of Public Opinion.

However, it would take only a comparatively small shift of sentiment to give President Truman the lead in three other states—Connecticut, Maryland and West Virginia. The political scoreboard in the 12 states looks like this:

"If the presidential election were being held today how would you vote—for Truman, for Dewey or for Wallace?"

| New England | Dewey Pct | Truman Pct | Wall. Pct | Undec. Pct |
|---|---|---|---|---|
| Maine | 56 | 34 | 3 | 7 |
| N. H. | 54 | 36 | 3 | 7 |
| Vt. | 60 | 33 | 1 | 6 |
| Mass. | 50 | 43 | 2 | 5 |
| Conn. | 43 | 39 | 4 | 14 |
| R. I. | 37 | 48 | 3 | 12 |

| Mid-Atlantic | Dewey Pct | Truman Pct | Wall. Pct | Undec. Pct |
|---|---|---|---|---|
| N. Y. | 47 | 34 | 11 | 9 |
| N. J. | 50 | 38 | 3 | 9 |
| Pa. | 50 | 41 | 3 | 6 |
| Del. | 49 | 36 | 1 | 14 |
| Md. | 47 | 44 | 4 | 5 |
| W. Va. | 49 | 43 | 2 | 6 |

The above figures are not final reports on each state, but these findings are politically interesting at this stage of the campaign for the following reasons:

(1) The extent of Republican gains in New England and the Mid-Atlantic area since the last time Gov. Dewey ran for president, in 1944, can be seen by the fact that four years ago he carried only two of the 12 states, Maine and Vermont, whereas today he is leading in 11.

(2) Gov. Dewey and President Truman are only four percentage points apart in Connecticut and three in Maryland. In both those states the candidacy of Henry A. Wallace tips the scales in favor of the GOP in the sense that the Wallace voters would probably have been for Mr. Truman if Mr. Wallace had not thrown his hat in the ring.

The Wallace candidacy does not affect the situation materially in any other state of the 12 except New York.

(3) In New York state the Wallace vote is down somewhat from August when a survey by the institute found him polling 14 pct, as against 11 pct today in the Empire State. Despite the loss, the Wallace vote, by splitting the ranks of people who were Democrats in 1944, is the factor which gives the GOP such a large margin in the state.

A factor favorable to the GOP and unfavorable to the Democrats in New York is that voter registration in New York City, normally a Democratic stronghold, fell below expectations, indicating a good deal of apathy on the part of voters. A small voter turnout on election day hurts the Democrats more than the GOP, because a large percentage of the stay-at-homes are Democrats.

(4) Rhode Island's Democratic Party predilection is closely in line with its political behavior in recent national elections. In 1944 the state was not only the most Democratic in New England, but the most Democratic east of the Mississippi outside the South. In fact, except for the South, Rhode Island's Democratic percentage of 58.7 was third highest for the nation in 1944, being topped only by Arizona and Utah.

•

• • • **Analysis of the** polls on presidential preferences reveal that the large difference between the political sentiment expressed by farm and the big-city vote has been greatly reduced.

During the Roosevelt term of office a wide variation developed. Farmers shifted sharply away from the Democrats between 1940 and 1944, while voters in large urban centers continued to vote overwhelmingly Democratic. Now political forces are working in the opposite direction. Metropolitan areas reveal a strong defection from the Democratic party, while rural areas remain more or less stable. Thus the gap between the two is closing.

## Drift of Voters in Cities To Republican Column Noted As Farm Vote Remains Steady

o o o

But in the nation's largest cities the Democrats would today probably still hold an advantage over the Dewey-Warren ticket if it were not for the strength of Henry Wallace in those centers.

These trends come to light upon studying the institute's latest national figures which showed Gov. Dewey in the lead with 46½ pct of the popular vote, Truman 39 pct; Wallace 3½ pct; Thurmond, 2 pct and with 9 pct of voters still undecided.

When the national vote with "no opinion" eliminated is broken down by city size, this is the resulting picture:

BY CITY SIZE

| Size of town | Dewey Pct | Truman Pct | Wallace Pct | Thurmond Pct |
|---|---|---|---|---|
| 500,000 or more | 47 | 41 | 12 | * |
| 10,000 to 500,000 | 51 | 43 | 4 | 2 |
| Under 10,000 | 52 | 43 | 3 | 2 |
| Farm residents | 50 | 44 | 2 | 4 |

*Less than one pct.

The following table compares the proportion of the popular vote currently supporting Gov. Dewey with the Republican percentage of the major party vote in the last three presidential elections:

BY CITY SIZE
(Pct Republican)

| Size of town | 1936 Pct | 1940 Pct | 1944 Pct | Today Pct |
|---|---|---|---|---|
| 500,000 or more | 29 | 39 | 39 | 47 |
| 10,000 to 500,000 | 39 | 46 | 46 | 51 |
| Under 10,000 | 39 | 48 | 51 | 52 |
| Farm residents | 41 | 46 | 52 | 50 |

# Construction Steel . . .

• • • **Fabricated steel awards** this week included the following:

1165 **Tons,** Elsmere, Del., overpass for Delaware Dept. of Highways, through J. A. Bader Co., Wilmington, Del., to Bethlehem Steel Co., Bethlehem.

710 **Tons,** Odair, Wash., U. S. Bureau of Reclamation Spec. 2400 to American Bridge Co., Pittsburgh.

400 **Tons,** Broadwater and Gallatin Cos., Mont., bridges on Toston-Bozeman Road, through W. P. Roscoe Co., Billings, to Pittsburgh-Des Moines Steel Co., Des Moines, Iowa.

200 **Tons,** Philadelphia, school building, through Ralph S. Herzog, Philadelphia, to Bethlehem Steel Co., Bethlehem.

150 **Tons,** Middleton, Mass., Essex Co. sanitarium through Rich Bros. Construction Co., Boston to Groisser & Shlager Iron Works, Somerville, Mass.

• • • **Fabricated steel inquiries** this week included the following:

825 **Tons,** Louise, Ariz., U. S. Bureau of Reclamation Spec. 2431, Davis Power Plant. Bids close Nov. 4.

800 **Tons,** Middlesex, N. J., bridges, New Jersey Dept. of Highways, due Oct. 26.

250 **Tons,** Milwaukee, theatre building. Bids close Nov. 15.

180 **Tons,** Manville, N. J., grade crossing elimination for the Lehigh Valley Railroad, Oct. 29.

• • • **Reinforcing bar awards** this week included the following:

1150 **Tons,** Los Angeles, undercrossing and overcrossing, Hollywood Parkway at Melrose and at Vermont, through Spencer Webb, Los Angeles, to Bethlehem Pacific Coast Steel Corp., San Francisco.

410 **Tons,** Oakland, Calif., construction at Second Mokelumne Aqueduct, Unit C, East Bay Municipal Utilities District Spec. 81, to Judson-Pacific-Murphy Steel Corp., San Francisco.

300 **Tons,** Berkeley, Calif., Central Research Laboratory Bldg. No. 50, University of California, through Louis C. Dunn, Inc., to Jos. T. Ryerson & Son, Chicago.

185 **Tons,** Peoria, Ill., power house for the Illinois state hospital, awarded to S. N. Nielsen.

• • • **Reinforcing bar inquiries** this week included the following:

570 **Tons,** Los Angeles, overcrossing and undercrossing, Hollywood Parkway at Santa Monica Blvd. and at Normandie Ave., Calif. Div. of Highways, Los Angeles, bids to Nov. 4.

105 **Tons,** San Diego Co., Calif., highway construction between San Diego and Mira Mar, Calif. Div. of Highways, bids to Nov. 4.

100 **Tons,** Chicago, Greyhound bus station. Bids close Nov. 1.

100 **Tons,** Portland, Ore., pumping plant for Multnomah Co. Drainage District, Portland District, Corps of Engineers, Ser. Eng-35-026-49-207, bids to Oct. 22.

• • • **Steel pipe awards** this week included the following:

1700 **Tons,** Oakland, Calif., lined and coated steel pipe, East Bay Municipal Utilities District, to Consolidated Western Steel Corp.

185 **Tons,** Oakland, Calif., construction at Second Mokelumne Aqueduct, Unit C, East Bay Municipal Utilities District Spec. 81, to Columbia Steel Co.

# 50 YEARS AGO

THE IRON AGE, *Oct. 12, 1898*

• "In more ways than one the situation in the iron and steel trades of Great Britain is, at the present time, peculiar and embarrassing. The fact is that the competition of American iron hangs like a dead weight around the neck of the trade, and checks that elasticity of prices that would otherwise be inevitable at a time when the demand is so large and the outlook so favorable."

• **"The Elwood-Ivins Tube Co. of Philadelphia are drawing a special aluminum alloy down to 36 gage on steel tubing. It is drawn on the outside, inside, or both. This is accomplished by a machine which is said to bring the cost down to a little over that of ordinary galvanized tube."**

• "Application of small power units in the railroad industry for pumping of water is a subject which until recently has not been studied very carefully from an economic standpoint. A pump, an old boiler and a man in charge are the component parts of most installations of this type. Serious thought should be given to the adoption of gas and gasoline engines in small pumping plants."

• **"An entirely new method for the manufacture of table cutlery is being introduced into Sheffield, England. A round bar of steel is placed in a machine and by means of hydraulic pressure, a perfect knife including blade, bolster and handle, is formed. Capacity of one machine is said to be 5000 knives per day."**

• "A leading Chicago merchant states that while the Spanish war was largely the result of newspapers and politicians activities, through the providence of God it had turned out to be an instrument to accomplish a great end. He said that the time had passed for nations, however small, to be oppressed."

• **"Canadian manufacturers are by no means enthusiastic for reciprocity with the United States. To them it is but another name for further tariff reduction and though none of them would object to that on their raw materials, all would oppose it on their products."**

## Barge Fleet Completed

*Pittsburgh*

• • • **Dravo Corp.** has delivered the last of a fleet of eight steel hopper barges to the Ohio River Co., Cincinnati. The barges will carry solid fuel on the Illinois River. Each of the 195-ft by 35-ft barges has a capacity of 1500 short tons.

The company is also building a fleet of five hydrochloric acid barges for Dow Chemical Co., Texas division, Freeport, Texas. Delivery of the first barge is scheduled for the end of October.

## Oil Company Orders Nine Articulated Tank Barges

*Pittsburgh*

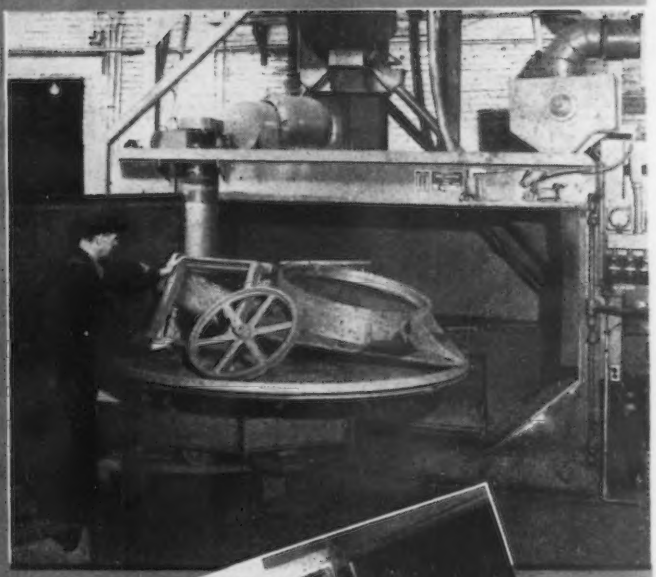
• • • **Nine more tank** barges have been added by Ashland Oil & Refining Co., Ashland, Ky., to the fleet of 15 now under construction at Dravo Corp.'s shipyard, here. The second contract calls for nine articulated tank barges identical in design to the fleet previously ordered from Dravo.

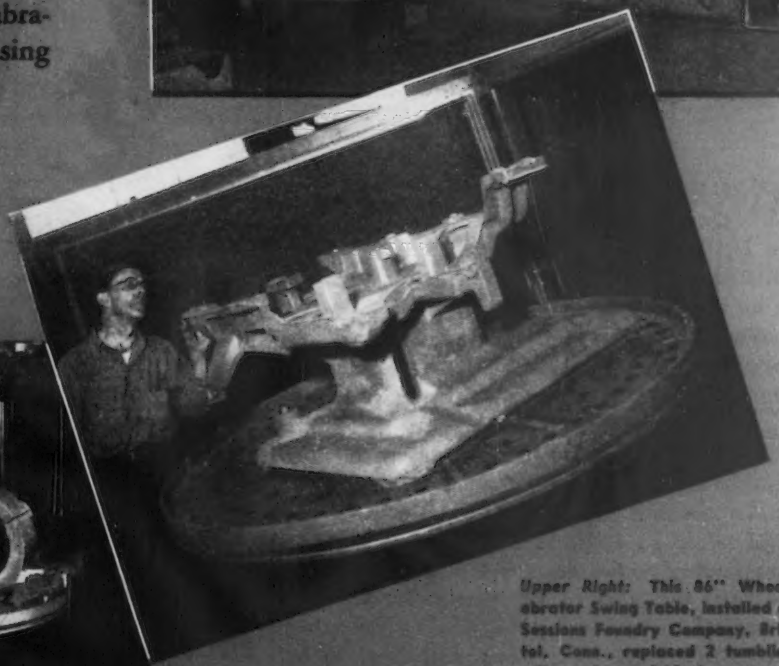
Operating as a single fleet, the nine steel barges will be towed three abreast and three deep. The three leading units will be built with shaped bows and square, box-like sterns; while the three aft units, interchangeable with the others, will have square bows and shaped sterns. The middle units, with square bows and sterns, will be integrated between the leading and aft units. The fleet will look like a tow of three single barges.

# SWING TABLE Advantages

sand and scale from every nook and cranny.

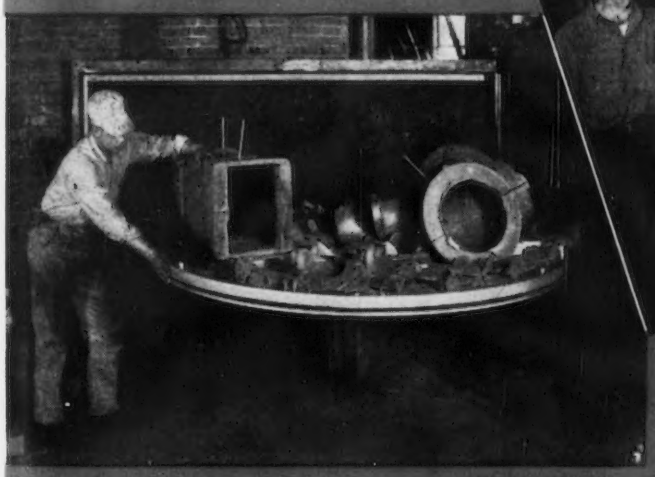
Operating in this manner, the Swing Table replaces the unhygienic air-blast room on 80% of all work and becomes a versatile general purpose machine for the shop whose work would otherwise require the purchase of several different types of cleaning machines. Equally important are the benefits provided by the Wheelabrator in slashing costs and increasing output.





*Upper Right:* This 86" Wheelabrator Swing Table, installed at Sessions Foundry Company, Bristol, Conn., replaced 2 tumbling mills and an airblast room. It cleans loads of castings weighing up to 5000 pounds in 4 minutes.

*Above:* Cleaning a quantity of castings in 3 hours that formerly required 8 hours to clean by airblasting, the 66" Wheelabrator Swing Table installed at the Fairview Foundry Co., replaced an airblast room, table and 3 tumbling mills.



*Above:* At the McNally-Pittsburgh Foundry Co., Pittsburg, Kansas, this Wheelabrator Swing Table cleans a 72" diameter sheave in 15 minutes that formerly required 4 hours to clean in an airblast room. Seven men were relieved for more productive work.

The new Swing Table Catalog No. 214-A is now available. It graphically describes the speed, economy and versatility of all five Swing Table sizes.

THE AMERICAN MOLDER

**American**

**Wheelabrator & Equipment Corp.**

*(Formerly American Foundry Equipment Co.)*

510 S. Byrkit St. Mishawaka 3, Indiana

## Receives Diamond Pin For 50 Years Service

*Pittsburgh*

• • • **Anthony Davia,** a director of the Dravo-Doyle Co., a subsidiary of the Dravo Corp., was recently presented a diamond pin by J. D. Berg, chief executive officer, in commemoration of his 50th year with the corporation.

Anthony Davia

Mr. Davia is the oldest employee in the company in length of service. Also honored were 384 other employees with 20 years service or more.

Mr. Davia started working for Dravo in 1898 as a water boy on a construction project and became an office boy a few months later. From 1902 until 1945 he was purchasing agent for the corporation at which time he assumed his present duties.

## Employment Expansion Increases Payrolls

*Washington*

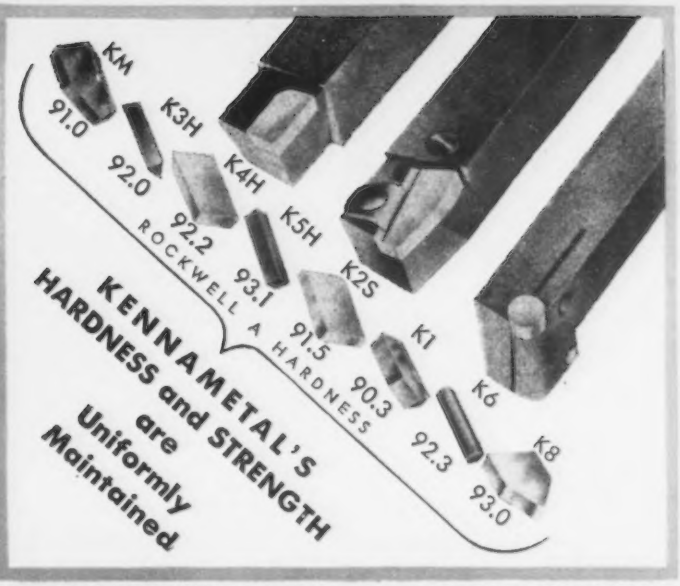
• • • **Led by the** iron and steel group, expansion of employment has brought manufacturing payrolls to a new high for the year of 45,514,000, according to the Bureau of Labor Statistics report for August.

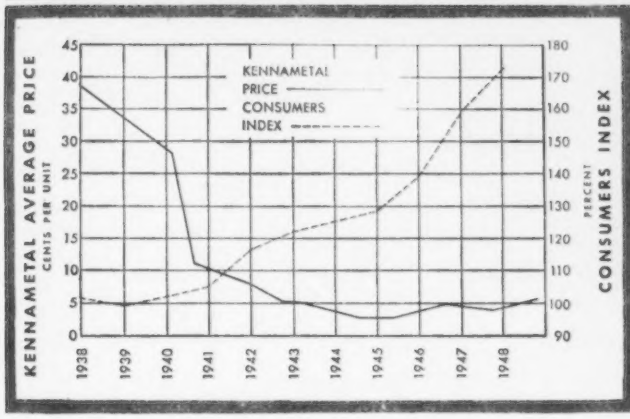
Total nonfarm employment is estimated at 52,800,000 with unemployment amounting to 1,900,000. This represents an employment gain of 2 million above the figure a year ago.

Workers in iron and steel and their products now total 1,926,000 as compared with 1,884,000 a year ago. At the same time, according to a separate BLS report, the average weekly wage of factory workers has risen to a new peak of $53.86 for a 40-hr week.

Total national income, on the basis of Commerce Dept. reports, has currently risen to a rate of $221 billion annually. Of this amount, $25 billion was estimated as the rate of corporation profits and $52 billion as the profit rate for unincorporated business.

# The Best CUTTING TOOL is consistent in Performance Value




# The Best "MONEY TOOL" is consistent in Purchasing Value

Kennametal costs much less today than when introduced, 10 years ago, yet its value as a cutting tool material is superior.

Money is far "cheaper" today, the supply more plentiful —its purchasing power has been greatly depreciated.

Kennametal's distinctive processing, scientifically controlled, produces cemented carbide compositions that are uniformly hard and strong — consistently sound. Their "promised" qualities are readily convertible into outstanding, dependable performance wherever and whenever used.

Unfortunately the production savings effected by the use of Kennametal tools are earnable only in the "coin of the realm", which now is fiat money, of fluctuating value.

Tampering with the "processing" of our money tool has brought economic confusion, uncertainty, and insecurity. The savings of individuals have been jeopardized, the plans of business enterprises thwarted, and the very freedom of American citizens threatened.

Honest measures of weight, volume, and distance—a ton of coal, a quart of milk, a yard of cloth—are rigidly maintained Government Standards. Corresponding honesty in the measure of money value is even more vital to economic welfare.

An honest dollar lets an individual know with assurance the worth of his earnings and the reserves he has set aside for savings, insurance, and pensions. An honest dollar enables a business man to make firm, fair contracts, meet current and future obligations with certainty, and engage in creative ventures.

The most trustworthy money system ever devised is the convertible Gold Standard. If this were restored, as now proposed in a bill before Congress*, we could again have confidence in our currency as an efficient medium of daily exchange, a reliable measure of worth for today and value for tomorrow.

Kennametal Inc. has rigidly adhered to the practice of maintaining full value in every gram of its product. Although you still have to buy Kennametal with uncertain dollars, there is no uncertainty about the Kennametal you get. Just as there are different denominations of currency, so there are different "grades" of Kennametal, each having its specific "cash" value convertible into dependable service. From our Catalog 48 you can order Kennametal products with assurance.

* **Bill H. R. 5031** introduced into the House of Representatives, January 20, 1948, by Congressman Buffet of Nebraska cited as the "Gold Standard Act of 1948."

**A BILL**

"To restore the right of American citizens to freely own gold and gold coins; to return control over the public purse to the people; to restrain further deterioration of our currency; to enable holders of paper money to redeem it in gold coin on demand; to establish and maintain a domestic gold coin standard; and for other purposes."

KENNAMETAL Inc. Latrobe, Pa.

MANUFACTURERS OF SUPERIOR CEMENTED CARBIDES AND CUTTING TOOLS THAT INCREASE PRODUCTION

## Hold Formal Opening For New Hunter Spring Plant

*Lansdale, Pa.*

• • • **Formal opening of** Hunter Spring Co.'s new plant here recently was the final step in a 2-year program of expansion, refinement and modernization of facilities. It also marked the final consolidation of all of the company's spring-making operations into one unit. The new plant is located at 1 Spring Ave.

A group of 20 civic officials, leading engineers, and executives of industries in Montgomery County, Pa., were guests at a luncheon, plant tour, and official ceremonies marking the occasion.

The new brick-and-steel plant covers 35,000 sq ft and places coiling, grinding, heat treating, finishing, plating, inspection and engineering departments in one building, along with the general offices. Some 250 of the Hunter employees are housed in the new quarters, designated as Plant No. 2.

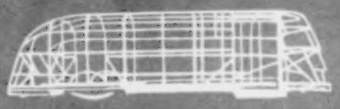
The old Main St. Plant No. 3 has been wholly converted to warehousing service. The Pierce St. Plant No. 1 now houses metal stamping operations, the tool and die shops, spring products assembly, and the company's Apparatus Div. which manufactures instruments for precision spring testing—all the activities which are not an integrated part of the basic production line.

**The outstanding** ingenuities in the planning of the new plant have to do with the flow sequence, the materials handling system and specially designed shop furniture fitted to each particular operation. The principal shop furniture items are all fabricated by welding from shaped ⅛-in. steel sheet and comprise the inspection island, finishing benches, setup men's benches, jig-and-fixture benches, and a tote-pan and racking spstem.

An interesting aspect of the plant design is that it was worked out in miniature to a scale of ¼-in. to the foot, except for the roof, but including scale model of every single machine and piece of equipment larger than a waste basket. The model was a design factor, not a show piece. It changed over the 2-year period as the plans changed.

According to W. J. Cooke, general manager, the production capacity of the operation has been upped at least 50 pct and its efficiency multiplied many times.

# Michigan WELDED STEEL TUBING



**The Modern Electric Resistance Welded Steel Tubing**

## ROUND

½" to 4" O. D. 9 to 22 gauge

**SQUARE-RECTANGULAR**

½" to 2" 20 gauge—1" to 2¼" 14, 16, 18 gauge

*Can be* **BENT** *also . . .*

**FLANGED, EXPANDED, TAPERED, DEPRESSED BEADED, EXPAND BEADED, ROLLED, EXTERNAL UPSET, INTERNAL UPSET, SPUN CLOSED, FORGED, BEVEL FLANGED, FLATTENED, SWAGED, FLUTED**





America is the "general store" of the world where almost anything can be bought, from "a pin to a piano." The far-sighted use by Men of Vision in business and industry of the most efficient and adaptable methods of manufacture has made this possible.

**MICHIGAN WELDED STEEL TUBING** is used by manufacturers as a low-cost solution to thousands of fabrication problems, because it simplifies design, reduces weight, eliminates inefficient operations. Whether you wish to form and machine the parts in your plant or order them prefabricated by Michigan you will find this tubing exceptionally uniform in structure. Available in round, square and rectangular shapes, and a wide variety of sizes.

*Engineering advice and technical help in the selection of tubing best suited to your needs. Address your inquiries to.*

## Michigan STEEL TUBE PRODUCTS CO.

*More Than 30 Years in the Business*

**9450 BUFFALO STREET • DETROIT 12, MICHIGAN**

***FACTORIES: DETROIT, MICHIGAN • SHELBY, OHIO***

**DISTRIBUTORS:** Steel Sales Corp., Detroit, Chicago, St. Louis, Milwaukee, Indianapolis and Minneapolis—Miller Steel Co., Inc., Hillside, N. J.—C. L. Hyland, Dayton, Ohio—Dirks & Company, Portland, Oregon—James J. Shannon, Milton, Mass.—Service Steel Co., Los Angeles, Calif.—American Tubular & Steel Products Co., Pittsburgh, Pa.—Strong, Carlisle & Hammond Co., Cleveland, Ohio—Drummond, McCall & Co., Ltd., Toronto, Canada.

## Plant Innovations To Be Featured At Annual Exposition

*New York*

• • • **Many innovations** that may improve the performance of power plants will be featured at the 18th National Exposition of Power and Mechanical Engineering here at the Grand Central Plaza from Nov. 29 to Dec. 1.

Among the new developments which visitors at the exposition will see is a 2000 h.p. fluid drive capable of pumping a million lb of water per hour into a high-pressure boiler.

Another exhibit will feature a type of steam turbine centrifugal marine boiler feed pump that is said to have made an almost clean sweep in tankers since its introduction.

An improved method of removing tramp iron from coal will be demonstrated; while a number of engineering improvements have greatly improved the performance of a spreader stoker. These include an electro hydraulic drive, alternate pusher coal feed and an "incremental" control valve for feed regulation.

With smoke abatement coming into critical regard in many communities, there will be considerable interest in a new "robot-eye" combustion control that automatically regulates the fuel-air ratio for smaller and medium sized heavy oil fired boilers.

With a thought for the exigencies of the fuel situation there will also be the exhibitor of a package type steam generator who features provision for a quick change-over of the "automatic fuels" light and heavy oil and gas.

In the long line of new instruments already assured for the exposition are a new pyrometer; a multiple recorder which traces four lines on a chart simultaneously; and several newly developed methods of automatic pH control.

The exposition will be held during the same week as the annual sessions of the American Society of Mechanical Engineers and is under the management of the International Exposition Co., with Charles F. Roth as manager, and E. K. Stevens, associate manager.

Some of the many Stewart-Warner products that come off Bliss Presses.

# ...and at Stewart-Warner 318 BLISS PRESSES


Just picture the range of different stamping problems involved in producing such a diversified line of products as speedometers, radios, lubrication service equipment, industrial gauges, car and aircraft heaters, and hardware. That's a sampling of Stewart-Warner's line. Then consider the variety of types and sizes of presses required.

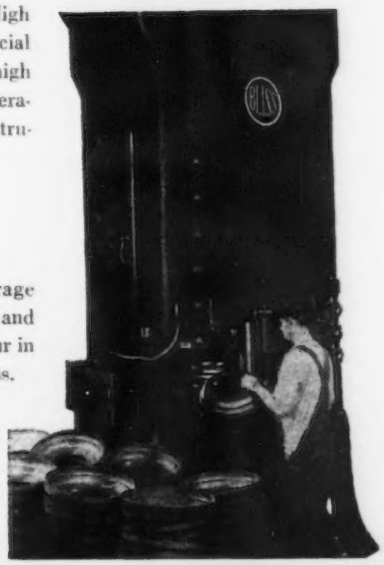
It's one reason why a high proportion of Stewart-Warner's press equipment is Bliss-Built—high production presses, batteries of inclinables, enclosed presses and coining presses, among others.

***Why does Bliss have such acceptance on this and so many other pressed-metal production lines?***

Because Bliss' field-trained engineers first analyze a customer's production requirement, then help select the *right press for the job.* At Stewart-Warner, high production presses were recommended for certain large quantity stampings while knuckle joint presses were adapted for sizing and swaging. The result is a steady output of uniformly good stampings produced more economically and efficiently.

Let a Bliss sales engineer help you get the most out of your presses—mechanical or hydraulic. You'll be drawing on a fund of engineering knowledge developed over 90 years. And you'll see why "Bliss" on your press is more than a name—it's a guarantee. Send for him today.

One of a battery of 10 Bliss High Production Presses, with special fixed inclined legs, used for high speed blanking and forming operations in Stewart-Warner's instrument division.




Steel covers for Alemite garage service equipment are pierced and trimmed at rate of 115 per hour in this Bliss 300-ton enclosed press.

**E. W. BLISS COMPANY, DETROIT 2, MICHIGAN**

*Mechanical & Hydraulic Presses, Rolling Mills, Container Machinery*

WORKS AT: Toledo, Cleveland, Salem, Ohio; Hastings, Mich.; Englewood, N. J.; Derby, England; St. Ouen sur Seine, France. SALES OFFICES AT: Detroit, Hastings, Mich.; New York, Rochester, N. Y.; Cleveland, Dayton, Toledo, Salem, Ohio; Philadelphia, Pittsburgh, Pa.; Chicago, Ill.; New Haven, Conn.; Windsor, Ont.

MARQUETTE · BLISS · CONSOLIDATED · TOLEDO ·

BLISS BUILT

**BLISS BUILDS MORE TYPES AND SIZES OF PRESSES THAN ANY OTHER COMPANY IN THE WORLD**

## Lowest Injury Rates Among Steelworkers

*Washington*

• • • **Safety records** among workers in iron and steel and their products continued to improve during the first half of 1948. Injury frequency rates are now five less per million manhours worked than for the average for 1947.

According to Bureau of Labor Statistics reports, lowest frequency rates are to be found among workers in steel plants themselves. There the rate is about 6 per million manhours as compared to 18 to 22 per million as found among forging, foundry, sheet metal and similar workers.

Greatest improvement was shown in forging plants where the frequency rate dropped from 28.4 to 18.5 during the first half.

On the other hand, the frequency rate rose slightly among aluminum and magnesium workers (3.2), motor vehicle factories (1.4) and auto parts (2.4).

The number of industrial injuries resulting in loss of 1 day or more of work is estimated at 111,000 for the second quarter. About 400 resulted in death and 5200 in permanent injury.

## WAA Clearing Warehouses

*Washington*

• • • **With more than** a dozen sales already scheduled for October, War Assets Administration is planning to hold at least 100 more in order to clear its warehouses of $300 million worth of property before Dec. 31.

Property for disposal in these sales include agricultural and mining machinery, automotive vehicles and parts, machine and other tools, building materials, and countless other kinds of items. Sales will be held by Chicago, Kansas City, Cincinnati, New York and Philadelphia regional offices.

Items to be offered have already been screened by the military services for withdrawal for defense purposes. However, right of the Defense Dept. to withdraw additional items will continue up until the day of sale.

Information should be requested from the nearest WAA Customer Center or regional office.

# First quality tool steels

**High Speed Steels**
Red Cut Superior
E. V. M.
Red Cut Cobalt
Red Cut Cobalt B
Gray Cut Cobalt
Vasco M-2
Van-Lom
8-N-2
Neatro
Vasco Supreme

**Die Steels for Hot Work**
Hotform
Choice
Marvel
Hotpress
Forge-Die
Red Cut Superior
("J" Temper)

**Die Steels for Cold Work**
Non-Shrinkable
Colonial No. 6
Air Hard
Crocar
Ohio Die
Red Star Tungsten
Colonial No. 4

**Carbon and Carbon-Vanadium Tool Steels**
Colonial No. 14
Colonial No. 7
Extra L
Elvandi
Red Star Tool
Red Star Vanadium

**Chrome Vanadium Tool Steels**
Vanadium Types D-G-H-K-N
Vanadium Type BB

**Tool Steels for Special Purposes**
Colhed
Par-Exc
Silman
Mosil
CM
Croman
Nikro M
Speed-Cut

*Manufacturers of*
FIRST QUALITY
OOL and DIE STEELS
*— exclusively*

# Every one
# • easy-working
# • tough-hardening

because of our

**Controlled**
**Melting**
**Formulas**

Developed through forty-five years of concentration upon the manufacture of First Quality Tool Steels, our Controlled Melting Formulas are unique. They are responsible for the *easy-working, tough-hardening* qualities that are self-evident in the behavior of our Steels . . . they benefit tool design and fabrication . . . they pay off in steel performance on the job. • Visit us and see the reasons—or let us demonstrate, and see the results!

## Vanadium-Alloys
STEEL COMPANY

COLONIAL STEEL DIVISION ANCHOR DRAWN STEEL CO.

LATROBE, PENNA.

## GM Opens Proving Ground to Public

*Detroit*

• • • **For the first time in the past 14 years, General Motors this week opened its 1200-acre Proving Ground to the public on a limited basis. More than 1000 members of the Detroit section of SAE held its first meeting of the 1948-49 season at the Milford test area on Friday, Oct. 1. E. P. Lamb of Dodge Truck is chairman of the Detroit section.**

**In addition to having an opportunity to inspect the test laboratory and shop facilities, members of the Detroit section were shown a special series of motion pictures in the Proving Ground auditorium before attending a beef barbecue and fish fry.**

**C. E. Wilson, General Motors' president, spoke on the subject, "Engineers as I Know Them", at the evening session. O. E. Hunt, executive vice-president, served as toastmaster.**

**E. N. Cole, chief engineer of Cadillac, is chairman of the passenger car activities which sponsored the kickoff meeting of the Detroit section.**

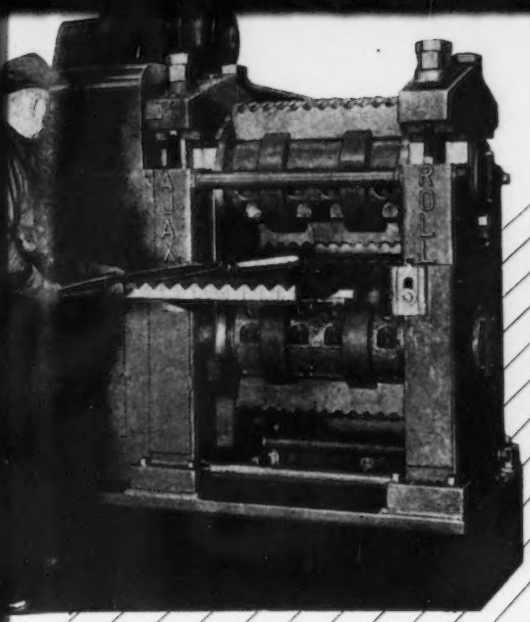
## Federal Bearings Co. Increases Its Prices

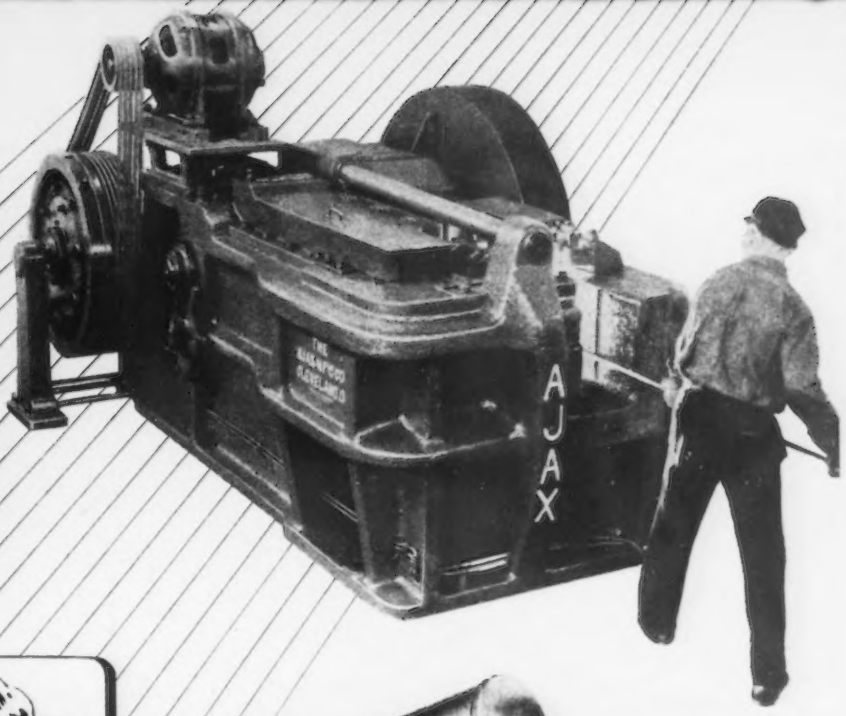
*Poughkeepsie, N. Y.*

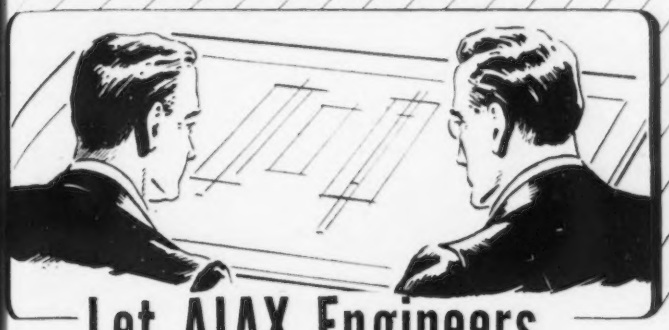
• • • **Prices of Federal ball bearings were increased on Oct. 1, according to George R. Bennett, Jr., president, The Federal Bearings Co., Inc., Poughkeepsie, N. Y. The rate of increase varied with each different type bearing but included the company's entire anti-friction bearing line.**

**Attributing the decision to raise its prices to continually mounting material and operating costs, Mr. Bennett said, "While we have tried to absorb a major portion of these increased costs, it has become necessary at this time to put a nominal price increase into effect on our products." Federal was the last of the major ball bearing companies to announce a price increase.**

**The company's ball bearings are used principally as original equipment in the automotive, aircraft, farm equipment, electrical and machine tool industries.**



# Let AJAX Engineers Aid You In Selecting *Forging Machinery*

Ajax engineers, thoroughly experienced in forging processes and forging machinery, can be of valuable assistance to the persons responsible for efficient forging production.

The Ajax Manufacturing Company manufactures a complete line of forging machinery - - - Forging Machines, Forging Presses, Forging Rolls etc. Ajax engineers, with the knowledge gained through research and development within their plant and through constant contact with the most progressive forge plants in the country, are experts in the field of forging. Whether your problem concerns the selection of one piece of forging machinery for the forging of a single part, or a multiple unit production line set-up from bar stock to the trimmed forging, Ajax engineers will welcome the opportunity to assist you wherever possible.


THE **AJAX** MANUFACTURING COMPANY

EUCLID BRANCH P. O. CLEVELAND 17, OHIO

110 S. DEARBORN ST. CHICAGO 3, ILLINOIS

DEWART BUILDING NEW LONDON, CONN.

## Predicts Mass Migration To Steelmaking Centers

*Cleveland*

• • • **Mass migration** of steel consumers to steel producing centers as a result of the Supreme Court's cement case decision was predicted here this week by George A. Bryant, president, Austin Co.

He said a four-point advance in the Austin index of industrial building costs for the third quarter reflects the combined effect of third round wage increases, advance in freight rates and the new pricing methods in cement, steel and other products as a result of basing point decision. The index now stands at 174 (1926 equals 100).

"When you put the additional cost of getting materials to building sites on top of the increases manufacturers have been forced to add to cover new freight costs since the abandonment of basing points, you get some indication of the troubles ahead unless Congress officially sanctions the absorption of shipping charges by basic raw material producers," Mr. Bryant stated.

"If the Supreme Court's basing point decision in the cement case is allowed to stand, we should be prepared for the possibility of mass migration of industries toward already overcrowded centers of production, many of which will tend to become little monopolistic empires in themselves," he added.

"While one can't blame steel producers or others for their speedy discontinuance of freight allowances when they saw the handwriting on the wall, their efforts to comply in advance with expected government directives may result in setting up insurmountable barriers to free trade and competition."

## Report Net Earnings

• • • **The Electric** Auto-Lite Co. reported consolidated net earnings of $4,785,773, equal to $3.20 per share for the 6 months ended June 30, 1948, after providing for taxes and all known reserves. This compares with net earnings of $5,057,865, or $3.38 per share, on the same basis, for the like period a year ago.

Mr. Royce G. Martin, president of the company, in commenting on the report, stated that the drop-

# ...and NOW

## Houghton still stays years ahead... is supplying these many products to metaldom:

### CARBURIZERS

New non-burning compound (Nucarb) does not exhaust on continued use; can be mixed with high ratios of used material. Also liquid carburizers, featuring Perliton "W," water-soluble salt that cleans off speedily in hot water.

### SELF-RECTIFYING SALTS

Liquid Heat 1145 for hardening and heating; Liquid 1550 for high heat bath in high speed steel treatment; other pure uniform salts for annealing, drawing, preheating and quenching.

### MARTEMPERING SALT AND OIL

For interrupted quenching use Mar-Temp Salt, possessing rapid quenching speed through the critical zone. Low melting point, low viscosity, high thermo-conductivity, stable and non-sludging. Its use assures freedom from distortion or quench cracks. For hot quench after carburizing, use Mar-Temp Oil, fortified to remain stable over long periods at heat, up to 400° F.

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Houghto-Quench for speediest oil quench of mass production runs. No. 2 Soluble Quenching Oil for stable, uniform depth of hardness in general shop work.

### CUTTING OILS

New Antisep All-Purpose Base, miscible with either oil or water, will handle 90% of all cutting and drawing needs. For grinding, use Antisep Soluble Oil. For heaviest duty machining with straight oil, specify Cut-Max.

### RUST PREVENTIVES

A series of nine Cosmoline products, including light inhibited oils, solvent mixtures and grease-type preventives, covering the range from temporary indoor exposure to long-term weather protection.

### METAL CLEANERS

The Houghto-Clean series, including alkaline cleaners, and featuring new emulsion-type cleaners as well as liquid synthetic detergents.

### OTHER AIDS

Metal processing products also include Houghto-Draw drawing compounds, Acitrol pickling inhibitors, Houghto-Black low temperature blackening salt, Houghto-Clean Rust Removers, Hy-Ten Core Binders (oil or resin), and fortified lubricants.

### SERVICE

No processing product of the types listed herein will give its highest value unless it is used as recommended and is serviced personally by a trained metal-working man. Houghton maintains a field staff of such men, all fully familiar with the practices and products.

Metal plants are urged to use this personalized service which has long provided a plus value for Houghton metal products. For descriptive literature on any of the products listed here, or help on matters involving the use of such products, write—

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**the Metal Working Industries**

off in shipments for the second quarter was due to work stoppage at certain customers' plants and the desirability of reducing inventories throughout the replacement market fields.

Mr. Martin further stated that increased material and labor costs adversely affected the net earnings. Two months of the third quarter have passed and corrective measures have been taken by the company to adjust prices wherever necessary, he said.

## Labor Relations Director

*Cleveland*

• • • **The appointment of** Gordon William Hostetter as director of labor relations for Associated Industries, Cleveland, has been announced by B. F. McClancy, general manager. He succeeds W. R. Meredith, who resigned to become a member of the faculty of Case Institute of Technology.

G. W. Hostetter

Mr. Hostetter brings to the association 8 years experience in contract negotiations. The past year he has been a private consultant in Chicago, where he concentrated entirely in this aspect of labor relations. Previously, he had been with the Metal Trades Assn.

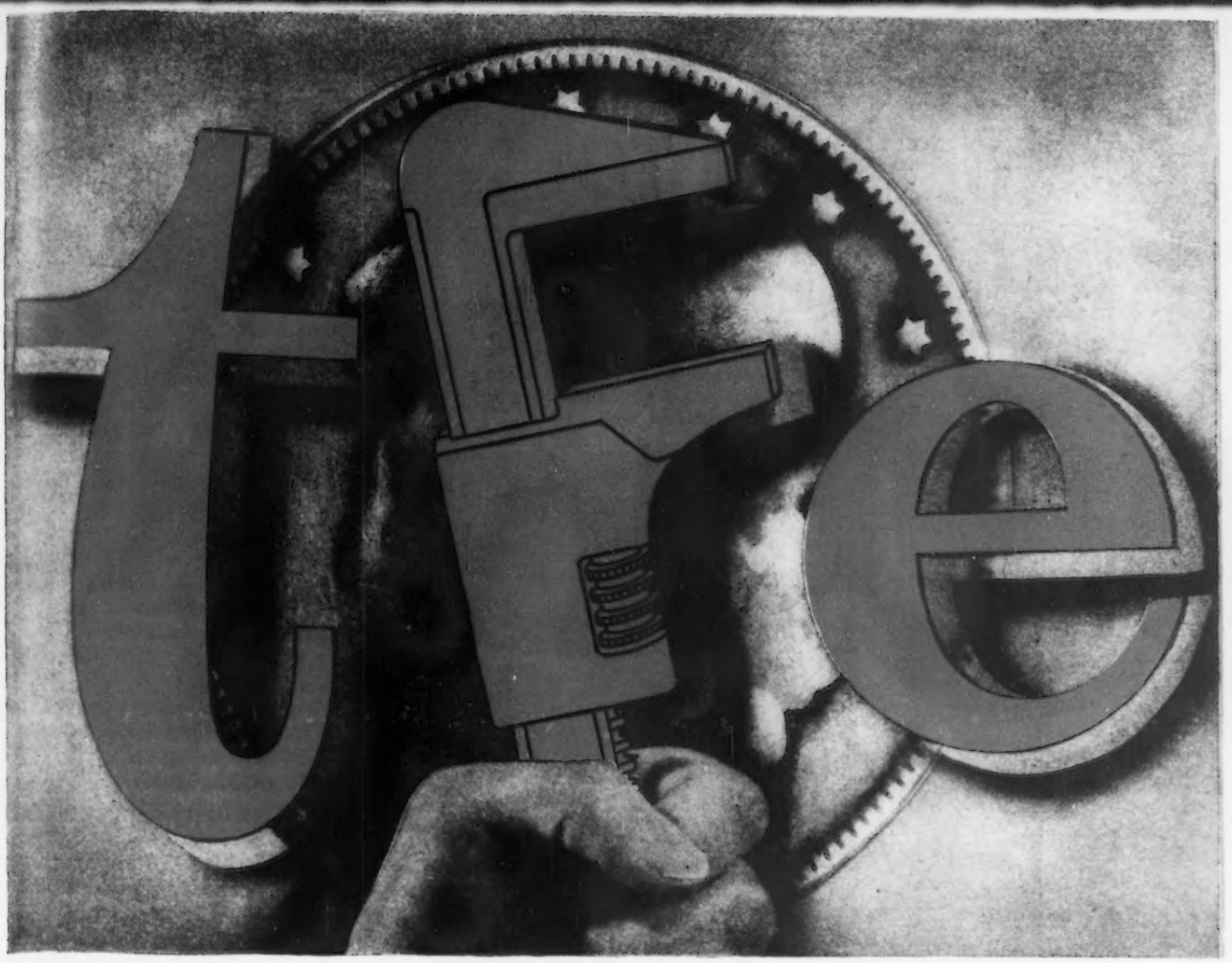
## SAM Conference Planned

*New York*

• • • **Disturbed over** continuing inflationary trends, the Society for the Advancement of Management has issued a call to more than 6000 business executives for a meeting in New York to blueprint plans for combating the rising wage and price spiral.

The conference will be held over a 3-day period from Oct. 28 through Oct. 30 at the Hotel Pennsylvania.

According to Paul A. King, chairman of the meeting, more than 2200 management men from 40 states have already informed the SAM that they will attend the conclave.




# Tighten up on Fastening Costs the t.f.e. way

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***You Get True Fastener Economy When You Cut Costs <u>These</u> Ways***

1. Reduce assembly time with accurate, uniform fasteners
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**RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY**

Plants at: Port Chester, N. Y., Corsopolis, Pa., Rock Falls, Ill., Los Angeles, Calif. Additional sales offices at: Philadelphia, Detroit, Chicago, Chattanooga, Oakland, Portland, Seattle. Distributors from coast to coast.

## Enamelers Will Study Problem of Product Damage in Shipment

*Cleveland*

• • • **A tentative plan** for attacking the problem of high damage costs incurred in shipping porcelain enameled products was drawn up by the coordinating group of the packaging and shipping committee of the Porcelain Enamel Institute during the group's recent meeting here.

According to Chairman Ralph F. Bisbee, Westinghouse Electric Corp., the packaging and shipping committee will endeavor to work out a plan with industry and carriers that will result in "prevention rather than cure. A primary objective is the establishment of standard shipping tests which will determine before shipment if the packaged product will endure average transportation shocks", explained Mr. Bisbee.

As a first step in following the committee's plan, industry representatives will: a) standardize on test equipment to conduct shipping tests on the packaged porcelain enameled products; b) standardize on procedure and specifications for conducting these tests; (a and b to be approved by industry and carriers). Secondly, each manufacturer of porcelain enameled porducts will install a set of the approved test equipment or arrange for periodic tests to be conducted by an approved laboratory. Thirdly, each manufacturer will test, or have tested, the packaged product on the standardized test equipment according to the approved specifications. This procedure will apply to all new designs and will be a function of periodic production control. Lastly, laboratories, where the packaged product may be sent by any manufacturer to correlate his test results, will be certified by both industry and carriers.

**Mr. Bisbee emphasized** that these tests are to be conducted on the packaged product and will not encroach on manufacturers' prerogatives in product design or selection of packaging materials.

Commenting on this plan, Chairman Bisbee expressed the hope that carriers would conduct research investigations paralleling

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this work. "It is anticipated," he said, "that other projects now under consideration can be developed by joint action between carrier and industry groups".

Edward Mackasek, managing director of the Porcelain Enamel Institute, has reported that the efforts of the packaging and shipping committee are being met with "extraordinary enthusiasm," and that carrier and industry associations are offering "unqualified support".

## Sees Golden Opportunity For New England Steel

*Dixville Notch, N. H.*

• • • **"New England** has a chance to triple its steel production and create 50,000 new jobs," Dr. Alfred C. Neal, vice-president and director of research of the Federal Reserve Bank of Boston told the New England Council at Dixville Notch, N. H., on Sept. 18.

"Adoption of f.o.b. pricing by the steel industry has given New England a golden opportunity," he added. "By taking advantage of the change in method of pricing steel and by importing from Canada and using new methods of manufacturing steel, New England has an excellent chance to move ahead in this industry."

## Gains New Appointment

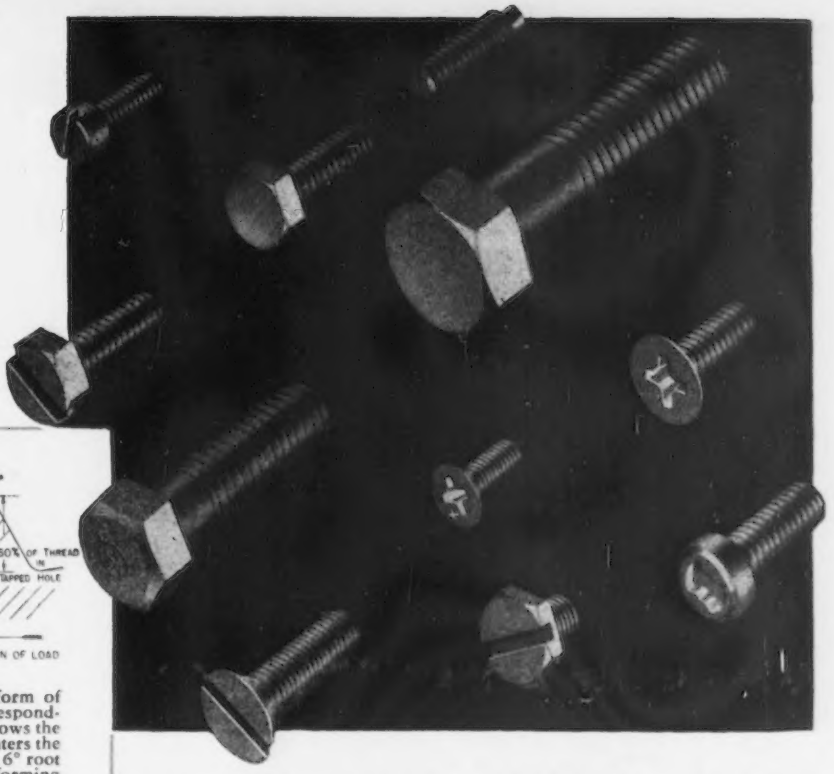
*New York*

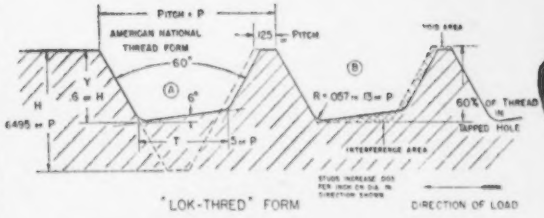
• • • **Dr. A. K. Wright,** chief radio engineer of the Tungsol Lamp Works, Inc., Bloomfield, N. J., has been appointed member of the Joint Electron Tube Engineering Council according to an announcement by Virgil M. Graham, chairman of the council and director of technical relations for Sylvania Electric Products, Inc.

Dr. Wright has been active in the Council's standardization program since its inception and was formerly chairman of the receiving tube committee.

The Council, sponsored by the Radio Manufacturers Assn. and the National Electrical Manufacturers Assn., has also appointed Frank Langstroth of the Lansdale Tube Co. as chairman of the receiving tube committee. A. K. Wing, Jr., of Federal Telecommunication Laboratories, Inc., has been appointed chairman of the high vacuum tube power committee.

# the only thread that **OF ITSELF** holds tight






The heavy black line at position A shows the form of "Lok-Thred", while the dotted line shows the corresponding American National Thread form. Position B shows the action which occurs when the male "Lok-Thred" enters the 60% American National Thread tapped hole. The 6° root angle, through the interference created, causes a reforming of the socket thread, which fills the void area and causes a locking action, plus a positive seal.

## IN "LOK-THRED", NATIONAL SCREW OFFERS AN IMPORTANT NEW TYPE OF BOLTS AND SCREWS

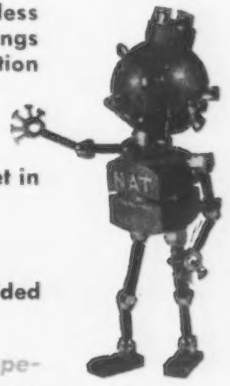
"Lok-Thred" fasteners actually become tighter in service, even under vibration. They are available now in bolts and screws as well as studs, and with special or standard heads.

They not only lock more securely than American National Threads (see diagram), but also seal positively, even against liquids under pressure. Bosses and blind tapping can be eliminated.

National HEADED AND THREADED PRODUCTS

### Note These Important "Lok-Thred" Advantages

1. Lock securely and become tighter in service.
2. Have much higher fatigue limits than fasteners with conventional threads.
3. Stronger in both tension and torsion than ordinary American National Threads.
4. Carry entire normal working load on 6° angle at root of thread under high compressive prestress.
5. Modified American National Threads permit use of standard tools.
6. Re-usable and on any re-application less than one-half additional turn brings torque back to its original installation value.
7. Do not require selective fits.
8. Do not gall when being driven nor fret in service.
9. Act as dowels and taper pins.
10. Seal positively and eliminate added bosses and blind tapping.




*Write for "Lok-Thred" booklet, or send specific information on your fastening problem.*

**THE NATIONAL SCREW & MFG. COMPANY, CLEVELAND 4, OHIO**

## New Dam to Open Coal Fields Near Morgantown For Pittsburgh Users

*Morgantown, W. Va.*

• • • **Construction of the** $6,343,650 Morgantown, W. Va., lock and dam is now under way. With modern locks sized to accommodate full standard coal tows, the new dam will throw open the coal fields around Morgantown for the first time to shipment of coal by water to Pittsburgh and points beyond.

Dravo Corp., Pittsburgh, has the contract for construction of the lock and dam. About 100 miles above Pittsburgh, it completes the chain of eight modernized dams on the Monongahela between Morgantown and Pittsburgh. It is being built immediately above the present Dam No. 10, which it will replace. Dam No. 11, further up the river, will also be made obsolete by the new dam.

The "lift" of the dam will be 18 ft, highest on the Monongahela. Its six gates will permit easy control of the pool above and aid regulation of its height during flood stages. Construction is expected to take approximately 3 years.

## Bethlehem Steel Co. Wins Safety Awards

*Bethlehem*

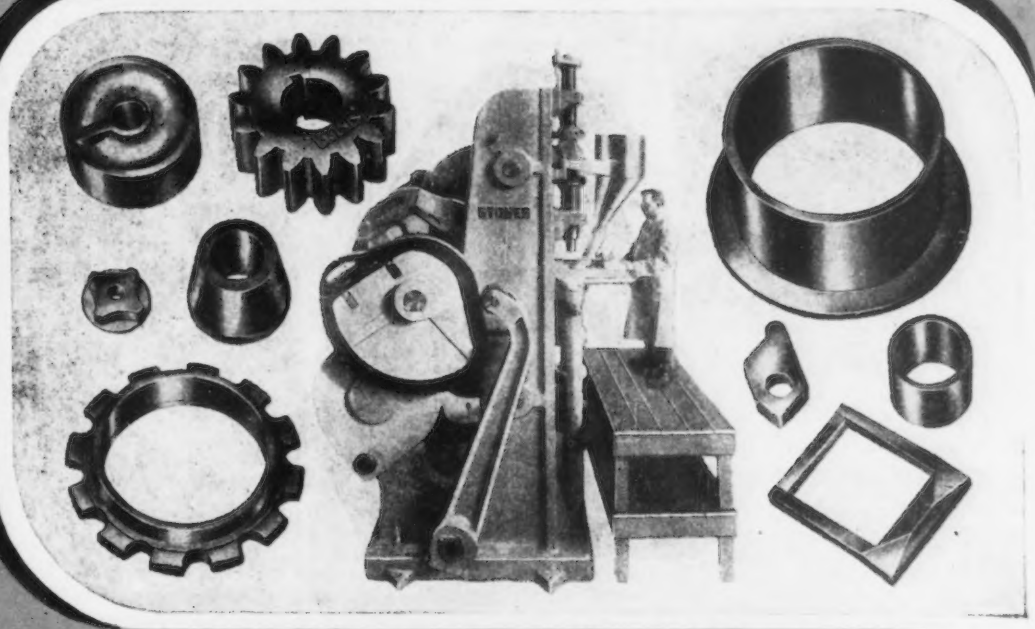
• • • **First, second,** third and fourth places in the 1947-1948 safety contest between the major steel plants of the country sponsored by the Metals Section of the National Safety Council have been won by plants of Bethlehem Steel Co., the company has announced. In addition, other awards have been made to operations of Bethlehem for outstanding work in the promotion of industrial safety.

Already twice a first place winner, the company's Johnstown, Pa., plant made it three in a row by again taking top honors. The Bethlehem plant was second. The plant at Lackawanna, N. Y., finished in third place and the Sparrows Point plant in fourth.

**Awarding of places** in the contest is based on the ratio of lost-time accidents to manhours worked over the 12-month period extending from July 1 to June 30

ASK STOKES

# Design in Powdurgy* to Save High Labor Costs



Stokes P-3 press (80 tons pressure) and typical powder metal parts

**SEE STOKES MODERN PRESSES MAKING POWDER METAL PARTS AT THE NATIONAL METAL EXPOSITION**

DESIGN for Powdurgy production to save on casting, machining, and material. Design for automatic compressing to reduce operating-time to the vanishing point.

Remember that powder metals, like any new material, can be a disappointing delusion in uninformed hands. Therefore, at every point of planning ask Stokes engineers to help you from the documented experience of more than 25 years in powdurgy production.

Stokes machines, in 1926, made the first porous metal bearings; then the cemented carbides, both now made chiefly on Stokes machines. Then came electrical, and more recently, electronic parts. Stokes has also developed the vacuum impregnating methods and equipment which fill porous bearings with the maximum amount of lubricant.

Stokes experience and demonstration laboratory are at your service. Consultation is invited.

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*Stokes makes Vacuum and Special Processing equipment, High Vacuum Pumps and Gages, Industrial Tabletting and Powder Metal Presses, Plastics Molding Presses, Pharmaceutical equipment, Water Stills and Special Machinery.*

*Stokes word for the theory and practice of making finished solid products from granular materials.

# STOKES KNOWS HOW

of the next year. Group A, in which the Bethlehem plants participated, comprised the nation's major steelmaking plants.

The National Safety Council initiated the contest in order to offer a further incentive to the steel industry toward the reduction of accidents. A plaque is presented to the winner of first place at the close of the contest. Second and third place winners receive certificates attesting their standing. Certain other contestants who show marked improvement in safety records receive Reduction Merit certificates.

Johnstown plant, first place winner for the third consecutive year, took the honors with less than one accident per million manhours worked, improving its 1946-1947 record by 37 pct.

Bethlehem plant, which has been four times a first place winner and four times in second place in the past 8 years, placed second.

At Lackawanna plant a remarkable improvement in accident reduction was achieved, the plant taking third place by accomplishing a 50 pct reduction in lost-time accidents.

Sparrows Point plant finished fourth, with an improvement of 30 pct over its rate for the previous year.

These four steel plants together showed a combined reduction of 33 pct in lost-time accidents with a frequency rate of 30 pct of that of the steel industry.

In addition to these plants, Bethlehem and Pottstown fabricating works finished first in their respective divisions.

## OK Three-for-One Split

*Peoria, Ill.*

• • • **At their annual** meeting held here shareholders of Keystone Steel & Wire Co. approved an increase in the company's outstanding capital stock from 625,000 to 1,875,000 shares for the purpose of issuing to stockholders two additional shares for each share now held. The new shares will be issued Oct. 15, 1948, to stockholders of record Oct. 1.

Shareholders elected E. J. Sommer a director for a 3-year term to succeed R. J. Kavanagh, whose term expired, and reelected D. P. Sommer and Theodore C. Baer for 3-year periods.

1 AIRCRAFT PRODUCTS: AN Bolts, Nuts, Screws, Studs, Cotters (including Stainless Cotters)

2 SEMS—Pre-assembled Screw and Lockwasher units

3 SPECIALTY NUTS, including co[illegible] barrel, plier, oblong, Tri-[illegible], half-round

4 BICYCLE PARTS, from axles saddle bolts to chain-adjus screws

5 FURNITURE BOLTS, Skein Nuts, Cabinet Bed Bolts and Bed Screws

6 MILLED STUDS in a full range of sizes

7 DARDELET RIVET-BOLTS with th locking thread . . . time saver for steel construction

8 WEATHER-TIGHT Bolts—*modern* fasteners for wood assemblies—eliminate counterboring

9 PHILLIPS and CLUTCH RECESSED HEAD Machine Screws and Sheet Metal Screws

10 PLACE BOLTS—for locking assemblies rigidly

11 "1035" SET SCREWS of hi-tensile heat-treated steel

12 ROAD MACHINERY and other heavy equipment parts—high tensile and alloy fasteners

13 COTTER PINS of steel, brass, aluminum and stainless steel

14 LAMSON LOCK NUTS—One-piece, all-steel—can be re-used repeatedly

15 PLASTIC INSERTS—made to your specifications . . . in production quantities

16 "BENT" Bolts, including U Bolts, J, L, Hook and Eye Bolts

17 WIRE ROPE CLIPS with the new Hi-Center Saddles and extra-strength U Bolts

18 PIPE PLUGS, square head and headless; forged steel, heat-treated

19 LOK-THRED STUDS—Thread[illegible] and *seals* in standard [illegible] holes

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20 "BOLTS, NUTS & SCREWS"—a compilation of impo technical articles on the manufacture, inspection, sp cation and use of fasteners; order from The Lamso Sessions Co. at $1.50 per copy.

21 "BOLT, NUT & RIVET STANDARDS"—a complete and up date standards book on commercial fasteners. Avail only from the American Institute of Bolt, Nut & Rivet Ma facturers, Hanna Bldg., Cleveland, Ohio. $2.00 per c

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VATOR BOL PRESSED and COLD PUNCHED NUTS • SKEIN NUTS
FIN HEAD NUTS • CAPPED NUTS • SLEIGH SHOE BOLTS • STO
VIS PINS • ( TLE BOLTS • MARSDEN NUTS • SELF-TAPPING SCREWS • FITTING-UP BOLTS • U BOLTS

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## for PRECISION and HOLDING POWER!


## LAMSON MILLED STUDS

Lamson Milled Studs are a great deal *more* than accurately made threaded fasteners. They are precision engineered parts—manufactured on the most modern equipment and tolerance-controlled for ease and speed in assembly operations.

Threads and shanks are true and concentric; which means that Lamson Studs turn straight in tapped holes and stand straight and true to receive other parts. There is no fumbling or forcing to assemble mated parts.

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## LAMSON LOK-THRED STUD

This new patented "super" stud fits into standard tapped holes, yet it *locks* and *seals*. For complete technical information on the Lamson Lok-Thred Stud, send for our free illustrated LOK-THRED booklet.

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FASTENERS

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NUTS • BARREL NUTS • OBLONG NUTS • CABINET BED BOLTS
PLASTIC INSERTS • EYE BOLTS • CLEVIS PINS • HINGE PINS •
UTS
UNCH
APPIN
WEATHER-TIGHT
SCREWS • CAP SCREWS • FIN HEAD

## Shipments of Enameled Ware Held Their Own During Second Quarter

*Washington*

• • • **Value of shipments** of porcelain enameled cast iron and steel plumbing fixtures for the second quarter of 1948 showed only a minor decrease (approximately $200,000) from the $40.2 million figure reported for the first quarter of this year. The second quarter total, however, represented an increase of approximately 40 pct over the $29 million figure reported for the second quarter of 1947, according to the Porcelain Enamel Institute.

During the second quarter of this year, unit shipments of porcelain enameled lavatory equipment decreased approximately 5000 units or 1 pct below the 438,000 units shipped during the first quarter. A total of 82,000, or 23 pct, more lavatory units were shipped during the second quarter of this year than during the corresponding quarter of 1947.

Shipments of kitchen sinks dropped off slightly (15,000 units) during this quarter from the 649,000 units shipped during the first quarter of 1948, and were 1.7 pct below the 645,000 units shipped during the same quarter of 1947. The number of bathtubs shipped during the second quarter (465,000 units) represented a decrease of 6 pct from the 497,000 units shipped during the year's first quarter; an increase of 10 pct or 42,000 units over the 423,000 units shipped during the second quarter of 1947.

## To Head Gas Group

*New York*

• • • **William F. McConnor,** vice-president in charge of sales of National Tube Co., Pittsburgh, a U. S. Steel Corp. subsidiary, was elected chairman of the Manufacturers Section of the American Gas Assn. recently.

The association's membership is comprised principally of companies who serve 90 pct of the utility gas distributed in this country. Currently, the association is engaged in a 3-year, $5 million research and promotional program—the largest in the industry's history.

## Executives' Reactions To Taft-Hartley

*New York*

• • • **The inclusion of** officials, as well as unio under the non-Commun section of the Taft- was the change in often suggested by veyed by the Na Conference Boar tion to the act operation.

The survey f more than one directly or indi ment in their with their ex from the not see exec

## ments of Enameled are Held Their Own ring Second Quarter

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**e of shipments** of porce- led cast iron and steel xtures for the second 948 showed only a e (approximately the $40.2 million or the first quar- The second quar- , represented an ximately 40 pct llion figure re- ond quarter of the Porcelain uarter of of por- uip-

## Executives' Reactions To Taft-Hartley Act

*New York*

• • • **The inclusion of company officials, as well as union leaders, under the non-Communist affidavit section of the Taft-Hartley Act was the change in the law most often suggested by executives surveyed by the National Industrial Conference Board on their reaction to the act after 1 year of operation.**

The survey found that slightly more than one-half believe that directly or indirectly an improvement in their company's relations with their employees has resulted from the act. Forty-six pct did not see any effect. Not one of the executives believed the act has resulted in a deterioration of their company's relations with employees.

Ninety-three pct favored the act. A large number of these executives felt, however, that the act "has definite shortcomings." Five pct felt that the act "has gone too far and has done more harm than good." Two pct failed to state whether or not they favored the act.

*Improved Relations with Workers*

A number of executives believe that the act has improved their company's relations with employees. In some cases, the executives could assign no specific reason as, for example, a midwestern industrial relations executive who wrote: "This improvement is intangible but we believe it exists nevertheless."

An employee opinion poll conducted by a large midwestern manufacturing company showed that the workers believed that the act benefited them, according to the company's industrial relations director.

*Changes Suggested*

Three out of four executives suggested changes in the Taft-Hartley Act. The remaining one-quarter stated that they did not believe the one-year period furnished sufficient experience to recommend revisions.

Among the principal changes suggested are: Change the requirement on the filing of non-Communist affidavits to include company officials wishing to use the NLRB; ban industry-wide collective bargaining; limit the scope of collective bargaining so as to eliminate compulsory bargaining on merit increases, and health, welfare, pension and other employee benefit programs.

*Union Shop Questioned*

Changes in the union shop provision of the act were suggested by 25 pct of the executives responding. The suggestions by executives on the union shop sections were twofold: One was for doing away with the requirement for NLRB-conducted union shop elections; the other was for outright banning of the union shop, just as the closed shop is presently banned.

*One Executive Wants Act Rewritten in Plain Language*

"Ideally, I think it would be beneficial if we could combine the Wagner Act and the Taft-Hartley Act into one clear-cut piece of legislation," writes the vice-president of an eastern firm. "Its provisions might be stated in simpler English, and not leave so much latitude for legal interpretations. Perhaps this type of legislation is a utopian dream."

*Background*

On June 23, 1947, Congress passed the Taft-Hartley Act. The act permitted a 60-day period of grace during which 1-year contracts with a closed shop and other forms of union security could be signed. The act as a whole, therefore, has actually been in effect since Aug. 23, 1947.

On Aug. 23, 1948, business executives had a full year in which to measure the effectiveness of the Taft-Hartley Act in its entirety. To get their reactions to the act, The Conference Board asked approximately 100 executives these questions:

(1) Do you believe the Taft-Hartley Act has brought about, directly or indirectly, an improvement or a deterioration in your company's relations with its employees?

(2) Do you favor the act or disfavor it? Why?

(3) Do you believe any sections of the act should be changed? If so, how?

## Will Observe British Metallizing Practice

*St. Louis*

• • • **William C. Reid** of East Swanzey, N. H., has left on an inspection tour of metallizing operations in England. While in England he will represent the American Metallizing Contractors Assn.

The trip is the result of an invitation to the association from the Metal Sprayers Assn. of England. Mr. Reid will observe the operations of some of the world's largest metal spray shops and will witness the execution of several large-scale applications of zinc to the structural members of construction projects.

The results of Mr. Reid's trip will be reported to the membership of AMCA at its next meeting in Tulsa Dec. 2-4.

GETTING READY: *British planes are stored in large numbers on a part of Burtonwood airfield, Warrington, Lancashire, largest base in Europe, where ground crewmen of the U. S. Air Force are engaged in putting the field in operational order. The crewmen will service superfortresses based in Britain and transports used in the Berlin airlift.*

## Scheduled As Speaker At Semiannual Meeting

*Detroit*

• • • **Kenneth T. Norris,** president of the Norris Stamping & Mfg. Co., will be the featured speaker at the semiannual meeting of the American Society of Tool Engineers which was held at Los Angeles, Oct. 11 to 13, according to Harry E. Conrad, executive secretary of the society.

Kenneth T. Norris

Mr. Norris talked on "Western Industrial Problems" at the banquet program of which movie actor Edward Arnold will be the toastmaster.

In addition to being the head of the company which bears his name, Mr. Norris is treasurer of the Thermador Electrical Mfg. Co. in Los Angeles and is chairman of the executive committee and also vice-president and treasurer of Compressed Gas Cylinders, Inc. in the same city.

## Cincinnati Scrap Men Reelect All Officers

*Cincinnati*

• • • **All officers** and members of the executive committee of the Cincinnati chapter of the Institute of Scrap Iron & Steel Inc. were reelected at a meeting of the chapter held here recently.

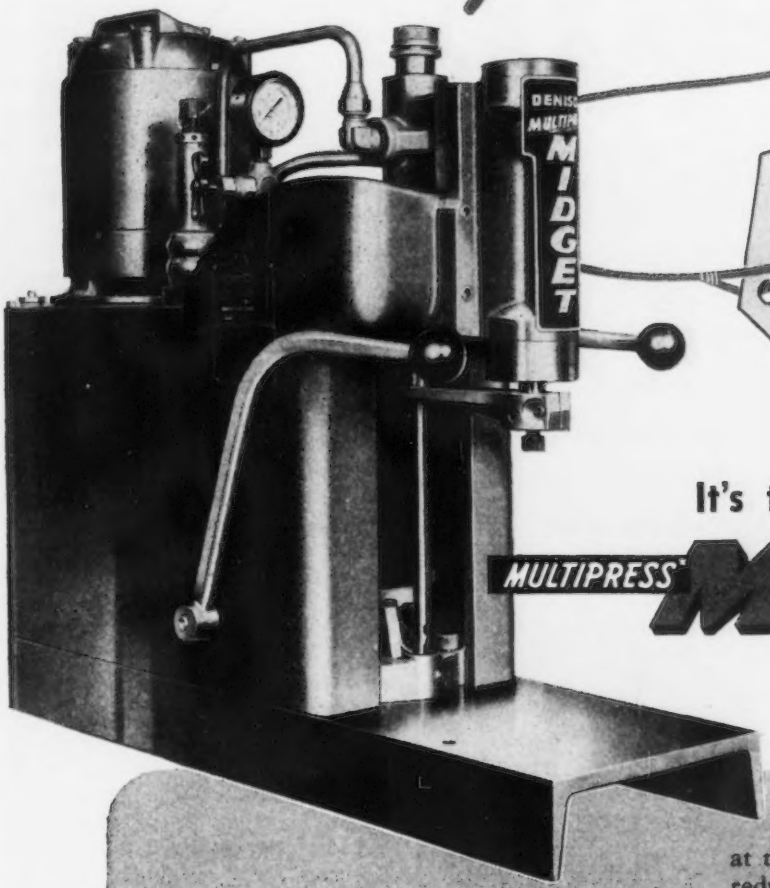
Ralph Kopelove, Kopelove Iron & Metal Co., Dayton, Ohio, was reelected president of the chapter and thus continues to represent the chapter on the national board of directors of the Institute.

Other officers re-elected include: vice-president, Roy Adams, Frank Adams & Co., Norwood, O.; secretary-treasurer, Louis Goldberg, M. D. Friedman Co., Portsmouth.

The executive committee reelected for the coming year is as follows: Emil Klempner, Klempner Bros., Louisville, Ky.; Joseph Mansbach, Mansbach Metal Co., Ashland, Ky.; L. W. Pryse, Hickman, Williams & Co., Cincinnati, O.; Ben F. Schottenfels, The David J. Joseph Co., Cincinnati, O.; Joseph Summer, Summer & Co., Columbus, O.

## Denison Announces a Complete

# Oil Hydraulic Press




for only **$325.00**

Less motor and starter.

## It's the NEW PACKAGED UNIT

## MULTIPRESS* MIDGET

* REG. U. S. PAT. OFF.

Now, for the first time, you can get a real MULTIPRESS, at a price comparable to other less versatile low tonnage equipment. Never before have the production-boosting, cost-cutting features of the MULTIPRESS been available in a 2000 lb. capacity press, *and at this low price.*

You'll get features in the new Midget which you can't get in any other type press. The oil-smooth hydraulic action exerts the same exact, preset pressure on the work—regardless of part size variation. There is no dependence on operator skill or "feel," and unskilled operators turn out high, reject-free production. Ram stroke, speed and pressure are all easily adjusted by controls at the operator's fingertips. Accidents are reduced to a minimum by the Midget's dual hand lever controls. The Midget can be rapidly switched from one job to another, due to its great versatility of control and the ease with which tooling can be changed. Compact and light in weight, the Midget can easily be moved anywhere in the shop. Being small in size and low in cost, the Midget is ideally suited for successive operation requirements.

If you're looking for all-around adaptability, increased production, reduced rejects, longer die life, better quality work, use of unskilled labor, higher employee morale—you'll want the MULTIPRESS Midget. Write for complete details and ask for Bulletin M-15A.

DENISON EQUIPMENT for APPLIED Hydraulics

**THE DENISON ENGINEERING COMPANY**

**1158 DUBLIN ROAD, COLUMBUS 16, OHIO**

## Cornell University Opens Lab of Nuclear Studies

*Ithaca, N. Y.*

• • • **The new $2 million Laboratory of Nuclear Studies at Cornell University will be formally opened this month, the university announced recently.**

The main laboratory building and an adjacent structure housing a 300-million-electron-volt synchrotron, was dedicated recently as part of the celebration of the 80th anniversary of the opening of the university.

The nuclear laboratory building is 160 ft long and 48 ft wide, with a useful floor area of 30,000 sq ft. The synchrotron laboratory building, connected to the main structure by personnel and service tunnels, is 70 ft long, 68 ft wide and 24 ft high.

**The main laboratory** building contains 16 single and three double laboratories, four radio-chemistry laboratories, two machine shops, an electronics shop, stockrooms containing some 3000 items, synchrotron control and detector rooms, and a roof deck for cosmic ray research. Its other facilities include conference, seminar, recreation and shower rooms, two darkrooms, and a kitchen.

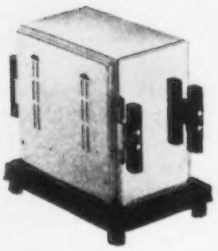
Control and detector rooms are located at the end of the personnel tunnel leading to the synchrotron building, close to the apparatus but shielded by 30 ft of earth and concrete. The shielding will protect delicate radiation-measuring instruments from scattered radiation which might be caused by operation of the synchrotron.

The cosmic ray laboratory, now being built on the roof deck and planned to measure 10 x 60 ft, will provide facilities for housing recording equipment for cosmic ray experiments. Other roof space will be available for setting up Geiger-Muller counters to measure extensive cosmic **ray showers.**

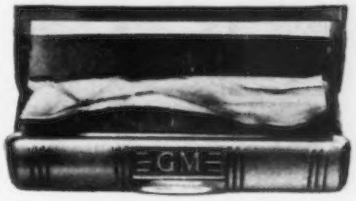
**Features of the** building include a loading platform equipped with a monorail hoist, an elevator with a carrying capacity of 4000 lb, and special aluminum sunshades on the south side of the building to keep out direct rays of sun in summer and admit them in winter.

Much of the research work of the laboratory will center around the synchrotron, now undergoing

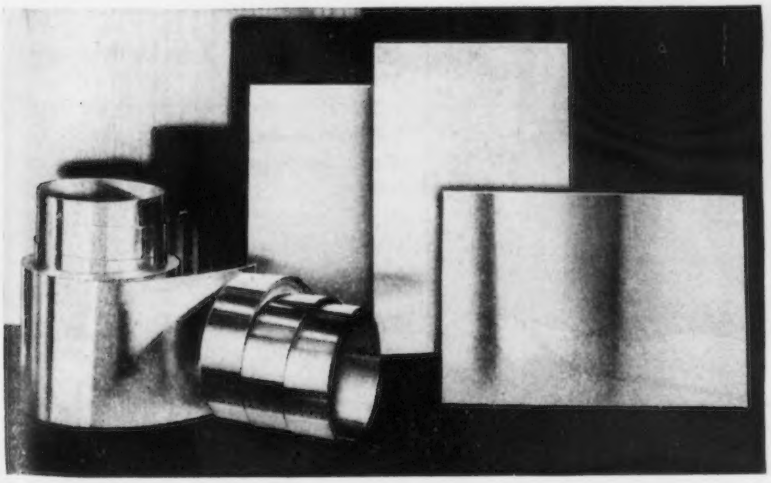
# Highly Plated Sheets and Coils Can Be Successfully Fabricated

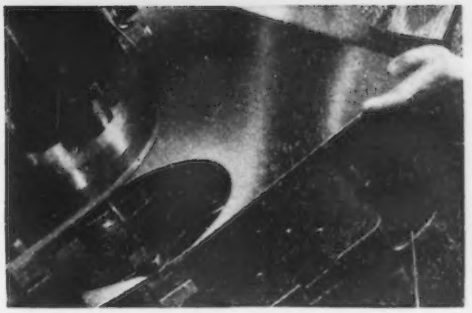


Despite their highly finished plated surface, pre-plated metals in sheets and coils can be successfully fabricated under modern mechanical production methods. Nickeloid Metals save the headaches of specialized departments and eliminate as many as three manufacturing steps, such as cleaning, plating, and polishing. It is not hard to maintain the lustrous finish of Nickeloid Metals. Choice of the proper metal, care in the making and handling of die equipment and the same handling care given any *finished* part — are points of good shop practice to be observed. Nickeloid pre-plated Metals may be soldered, riveted, blanked, drawn, formed, bent, spot welded, seamed, etched, and lithographed or silk screen printed. With some base metals, room temperature is important. For best results bends should be made against rather than with the grain. The larger the radius of the bend the less distortion of finish. For situations where unusually severe production conditions prevail, Mar-Not paper or plastic film applied to the face of the metal affords absolute protection; yet peels off as easily as a banana skin.

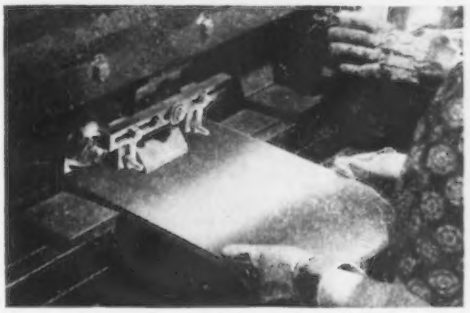



Nickeloid Metals are available in finishes of Nickel, Chromium, Brass or Copper electroplated to base metals of zinc, steel, brass, copper, or aluminum. Also colors on steel or zinc. Available in sheets, long continuous coils, or long flat strips . . . wide range of gauges and tempers . . . plated one or two sides . . . bright or satin finish . . . and all finishes supplied in numerous attractive crimps, patterns and corrugations.





Blanking is a common operation with Nickeloid Metals. With good shop practice, results are highly successful.



Bending of Nickeloid Metals, with power brake, press brake, or folder, presents no difficulties in fabrication.

Thousands of plants are successfully stamping Nickeloid Metals. Workman is stamping Kleenex dispenser (shown at left).

Nickeloid Metals may be spot welded without damage to their highly polished surface, as shown above.

**BOOKLET FREE** Those interested in methods of fabrication of pre-plated Nickeloid Metals should write on their company stationery for our illustrated Fabrication Handbook. It's free.

**AMERICAN NICKELOID CO.**
**PERU 2, ILLINOIS**

preliminary testing in its adjoining building. The machine, 13 ft in diameter and weighing 85 tons, will accelerate electrons to an energy of 300 million electron volts.

Financial support for construction of the machine has been provided by the Office of Naval Research.

With the synchrotron, Cornell physicists hope to produce mesons, mysterious particles which are believed to hold the atom together. In supplementary investigations, they hope to determine whether familiar electrical laws stand up under the high energies which will be produced by the synchrotron.

## Buys New Turbine For High Temperature Duty

*Pittsburgh*

• • • **The Sewaren** Generating Station of the Public Service Electric and Gas Co. of New Jersey will shortly install a new 100,000 kw turbine that is to operate at 1500 lb steam pressure and 1050°F in feeding a new 3600 rpm tandem compound double flow machine. This is the first steam power plant to be constructed for operation under such conditions.

While the highest temperature previously used in turbines is 1000° F, it is the last 50°F that makes the job tougher. To withstand operating in the dull red region, steam containers such as the throttle valves, steam chests and other high pressure parts of the turbine are constructed of 18-8 stainless steel. Fabrication of parts from this hard-to-work material has been a problem in itself.

**The importance of** the 50°F rise in temperature is in the fuel savings. For each 50 degree increase, the quantity of coal required to produce one kwh of electrical energy is decreased by about 1.4 pct.

In 1915 the output of all Westinghouse steam power plant turbines averaged only 525 kwh per ton of coal burned. With further developments toward increased plant efficiency, the output of all steam power plants by 1945 was 1550 kwh per ton of coal burned. These figures include both old and modern plant equipment in service during the year mentioned. This new turbine will produce about 2500 kwh of electrical energy from each ton of coal burned.

# How to Build Stronger, Lighter Levers at Less Cost

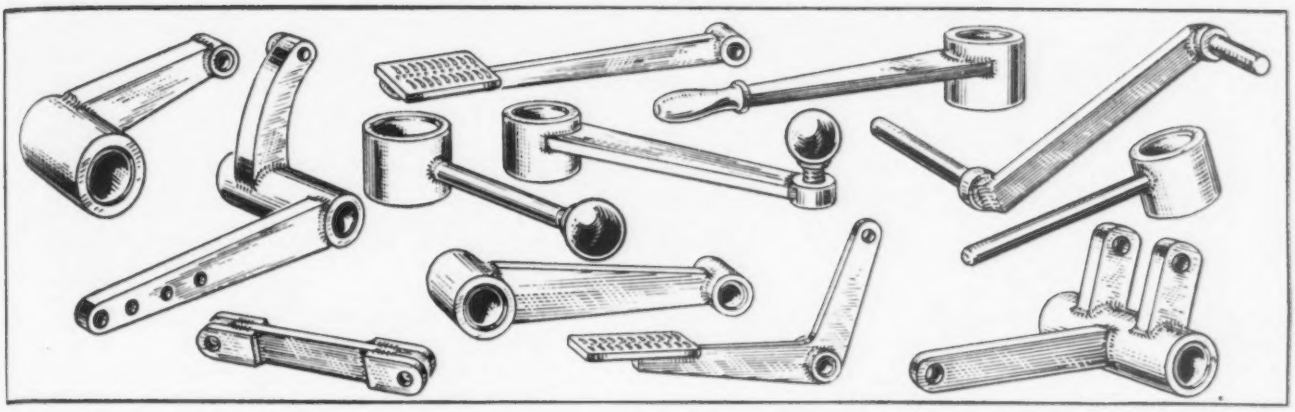


*Fig. 1. Typical machinery operating levers that are being weld-fabricated at lower cost with arc welding.*

ALL types of levers are being weld-fabricated in shops throughout the country, helping to produce stronger, lighter machinery construction with improved appearance . . . *all at less cost than with other methods.* Here is how these levers are built:

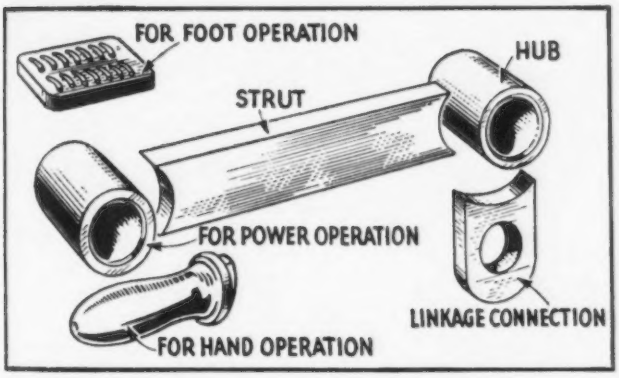



*Fig. 2. Basic elements of levers for different types of operation.*

More detailed data on the design of levers for arc welding is contained in the "Procedure Handbook of Arc Welding Design and Practice." Price $1.50 postpaid in the U. S. A.; elsewhere $2.00.

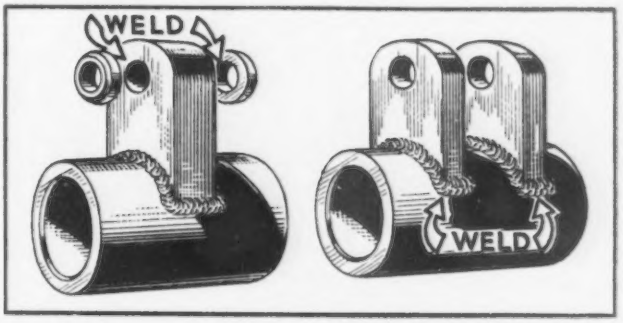



*Fig. 3. Linkage connections for power take-off, made from steel straps.*

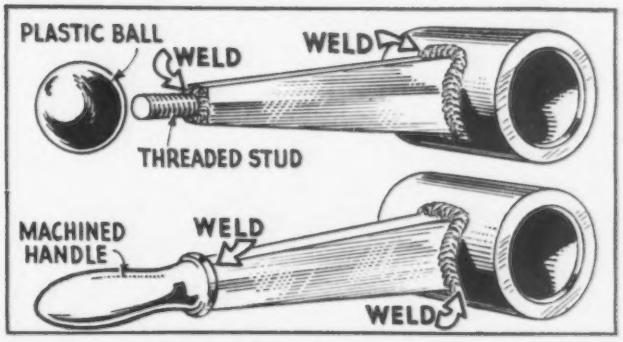



*Fig. 4. Handles weld-assembled for manual operation.*

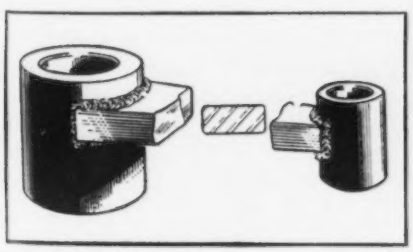


*Fig. 5. Plain rectangular strut welded to hubs. For normal loads.*

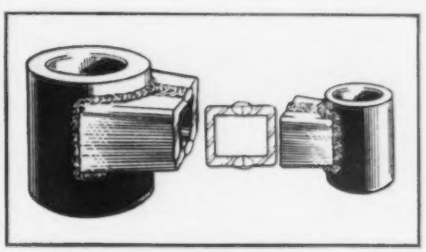


*Fig. 6. "Box" section design strut for strong, light-weight construction.*

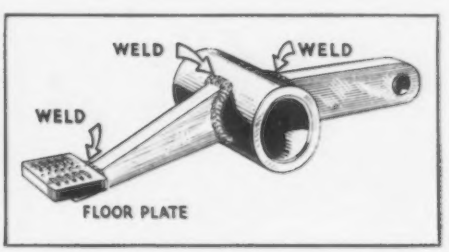



*Fig. 7. Floor plate weld-attached for foot operation.*

## WAA Planning Plant Disposals Through Series of Auctions

*Washington*

• • • **War Assets Administration** is ready to push ahead with its plan for disposal of unwanted surplus industrial plants by the time-tested method of public auction.

At least a dozen plants throughout the country have been picked for such disposal. Plants and locations will be announced from regional offices as soon as sales arrangements have been made.

They consist for most part of white elephants. All of those selected to date have previously been offered for sale but no suitable bids were received. Because of upkeep costs, officials say, they must be sold promptly or postwar maintenance will eat up any possible return.

Although the auction sale method was decided upon some time ago, WAA held off putting it into effect until a test sale could be held at Garland, Tex. The $2 million Continental Motor Corp. plant there was knocked down under the hammer recently for $611,000 after other methods had failed.

## Announces Completion Of Expansion Program

*Cleveland*

• • • **Completion of** extensive expansion at its Elyria Parts Div. was announced recently by A. W. Smythe, vice-president and general manager of the Thew Shovel Co., manufacturers of power cranes and shovels.

Included in the program were additions to Thew plants Nos. 3 and 5, both located near Hazel and Beech Sts., Elyria, Ohio.

Plant No. 5 is a manufacturing plant which currently produces all pins and bar steel products and bronze parts for both new production and service parts. The foundry at Plant No. 5, in which all bronze bushings are made, was expanded by the addition of a one-story, masonry and steel addition, 40 x 80 ft. The installation of new foundry equipment will permit the manufacture of bronze bushings by the modern and more efficient means of centrifugal casting.

**Expansion at** Plant No. 3, the Parts Div., consists of three major


# *Big* NON-ECCENTRIC *Precision Bearings ...that's what* KAYDON *stands for!*

Eccentricity in the bearing shown above was held within **.0002"*** ("practically unheard of" precision for bearings of this size).

Such accuracy doesn't just "happen". It's the result of **KAYDON**'s development of all the required facilities, within this one organization, for producing all the types and sizes of bearings listed below. These unique facilities are fortified by engineering know-how and broad experience in solving difficult bearing problems. **KAYDON** has its own modern atmospheric controlled heat treating, hardening with sub-zero conditioning, precision heat treating, metallurgical laboratory, microscopy and physical testing facilities.

Unbiased as to any one type of bearing design, **KAYDON** always is in position to recommend the one best suited to your specific use.

Counsel in confidence with **KAYDON**.

**Ground on Frauenthal Precision Grinder*

**KAYDON** Types of Standard or Special Bearings: Spherical Roller • Taper Roller • Ball Radial • Ball Thrust • Roller Radial • Roller Thrust

**THE KAYDON ENGINEERING CORP., MUSKEGON, MICH.**

• ALL TYPES OF BALL AND ROLLER BEARINGS 4" BORE TO 120" OUTSIDE DIAMETER •

items, (1) a new steel warehouse 61 x 124 ft, (2) an L-shaped office addition covering 1620 sq ft and (3) the paving of 7000 sq yd of additional outside storage area.

The method of marketing and distributing spare parts to Thew customers is being handled today through a nationwide distributor organization consisting of 70 main offices and 59 branches in the United States and Canada. Practically all of these organizations carry a basic supply of Thew parts in stock so as to give over-the-counter service in the vast majority of cases.

The present expansion is another step in a long range plan which started in March 1943, with the purchase by Thew of the old Radiant Mills stocking factory, to provide building facilities for the establishment of a new and separate Parts Div.

Key Thew officials in Elyria are A. W. Wagner, manager of parts sales; N. W. Anderson, superintendent at Plant No. 3, and Cyril Brecknock, superintendent at Plant No. 5.

## Iron Production During August at Record Pace

*New York*

• • • **Production** of pig iron in August set a postwar monthly record at 5,204,204 net tons, compared with 4,840,280 in July and 4,856,513 tons a year ago, according to the American Iron and Steel Institute. The August output was exceeded only in a few wartime months.

Production in the first 8 months of this year totaled 38,652,271 tons, an increase of about 85,000 tons over the same part of 1947.

The foregoing production figures do not include output of ferromanganese and spiegeleisen. Including these products, output of the 8 months was 39,116,085 tons, at 87 pct of capacity, compared with 38,986,974 tons at 89.1 pct of capacity a year earlier.

## Heads Business Group

*Lincolnton, N. C.*

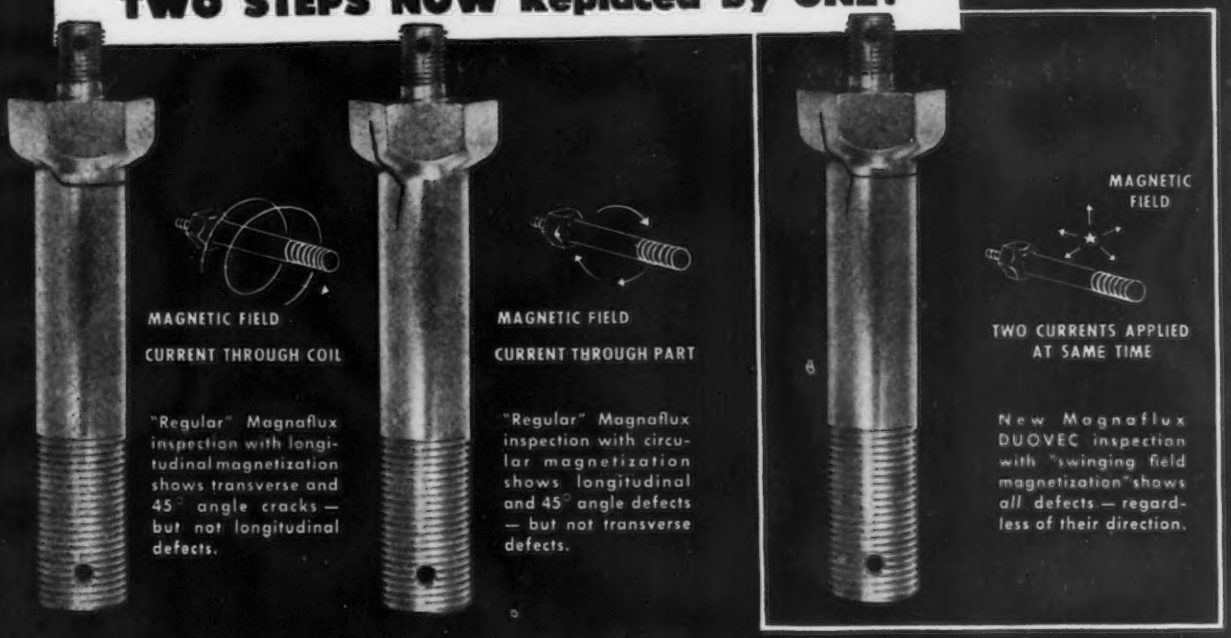
• • • **Nelson L. Smith,** president, Eureka Iron Works, was elected chairman of a new business group organized under the auspices of Gray Iron Founders' Society last week.

# New Magnaflux* DUOVEC Inspection

## Cuts Inspection Time In Half!

## Shows *Every* Flaw In *One Operation*

**TWO STEPS NOW Replaced by ONE!**




Magnaflux DUOVEC inspection, completely new, now enables you to give a complete automatic inspection of parts on the production line in *half* the time formerly required. A new line of Magnaflux units enables the operator to inspect for defects *in any direction* with *one* magnetizing operation and *one* visual inspection instead of two or more.

DUOVEC is most effective for smaller parts in cylindrical or bar shape. Bolts, wrist pins, roller bearings, small gears, camshafts, etc., can be inspected in high volume. Write today for full information on how Magnaflux can help you raise product quality and cut production costs.

MAGNAFLUX CORPORATION

REG. U. S. PAT. OFF.

*Magnaflux, Reg. U. S. Pat. Off., a trade mark of Magnaflux Corporation applied to its equipment and materials for magnetic particle inspection.

**See DUOVEC in Action at the Metals Exposition**

**A Magnaflux "MV" unit using the new DUOVEC magnetization will be introduced and demonstrated at the Magnaflux Corporation Booth during the A. S. M. National Metals Exposition in Philadelphia, October 25-29. Put it on your "be-sure-to-see" list!**

**MAGNAFLUX CORPORATION**

**5902 Northwest Highway, Chicago 31, Illinois**

**New York Detroit Dallas Los Angeles Cleveland**

## Industrial Group Elects Officers and Trustees

*New York*

• • • **Herbert H. Rogge,** vice-president of Westinghouse Electric Corp., and Frank M. Folsom, executive vice-president of the Radio Corp. of America, were elected chairman of the board and president, respectively, of the Navy Industrial Assn. at its fifth annual meeting. Other officers were elected as follows:

| OFFICE | OFFICERS |
|---|---|
| Vice-Chairman of the Board of Trustees... | Walter Geist, president, Allis-Chalmers Mfg. Co., Milwaukee. |
| Chairman of the Executive Committee... | J. R. MacDonald, first vice-pres., General Cable Corp. New York. |
| First National Vice-President ..... | Ben Moreell, president, Jones & Laughlin Steel Corp., Pittsburgh. |
| Second National Vice-President ..... | George W. Codrington, vice-pres., General Motors Corp., Cleveland. |
| Third National Vice-President ..... | J. W. Shipman, vice-pres., Automotic Electric Co., Chicago. |
| Secretary ..... | John H. Flagg, president, Watson-Flagg Machine Co., Inc., Paterson, N. J. |
| Treasurer ..... | E. E. Puryear, asst. to chairman of board, The Texas Co., New York. |
| Assistant Secretary, Assistant Treasurer.. | Earl L. Canfield, president, The Sight Light Corp., Deep River, Conn. |

Fifteen Trustees were elected for a 3-year period expiring in 1951 as follows:

**TRUSTEES**

**Term Expiring 1951**

Bromwell Ault, vice-president, Interchemical Corp., New York.
Harold Boeschenstein, president, Owens-Corning Fiberglas Corp., Toledo.
Calvert Carey, president, The Yale & Towne Mfg. Co., New York.
Sidney J. Clark, assistant manager, Otis Elevator Co., New York.
Arthur G. Drefs, president, McQuay-Norris Mfg. Co., St. Louis.
W. A. Elliott, president, Elliott Co., Inc., Jeannette, Pa.
H. H. Ewing, Development Dept., E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
John H. Flagg, president, Watson-Flagg Machine Co., Inc., Paterson, N. J.
W. P. Kirk, vice-president, Niles-Bement-Pond Co., West Hartford, Conn.
F. R. Lack, vice-president, Western Electric Co., Inc., New York.
A. B. Layton, vice-president, Crown Zellerbach Corp., San Francisco.
J. P. MacDonald, first vice-president, General Cable Corp., New York.
Ben Moreell, president, Jones & Laughlin Steel Corp., Pittsburgh.
H. H. Rogge, vice-president, Westinghouse Electric Corp., New York.
J. Frederic Wiese, vice-president, Lukens Steel Co., Coatesville, Pa.

One trustee was elected for a 2-year period expiring in 1950 as follows:

**Term Expiring 1950**

J. S. McDonnell, president, McDonnell Aircraft Corp., St. Louis.

Three trustees were elected for a 1-year period expiring in 1949 as follows:

**Term Expiring 1949**

W. E. Curran, vice-president, Rheem Mfg. Co., New York.
W. B. Holton, Jr., president, Walworth Co., Inc., New York.
P. Ralph Mork, executive vice-president, Crane Co., Chicago.

## 11 Westinghouse Plants Win Awards for Safety

*Pittsburgh*

• • • **Eleven plants of** Westinghouse Electric Corp. have received one of the nation's highest industrial honors — the Distinguished Service to Safety Award of the National Safety Council.

The National Safety Council has granted awards annually since 1942 to companies which have had outstanding accident prevention programs and whose plants show a commendable reduction in accidents, an above-average safety record or one million man-hours of work without a disabling injury.

The award-winning plants of the Westinghouse Electric Corp. established a safety record for the year 1947 three times better than the average for the entire electrical industry. With 50 million man-hours worked during the year, an average of only one disabling injury occurred for every 2 million man-hours.

Mr. W. O. Lippman, Westinghouse vice-president, has announced the names of the 11 company plants honored with the award of the National Safety Council. They are:

East Springfield, Mass. (Electric Appliance Div.); Sunbury, Pa. (Home Radio Div.); South Philadelphia, Pa. (Steam Div.); Newark, N. J. (Meter Div.); Lima, Ohio (Small Motor Div.); Baltimore, Md. (X-ray Div.); Lansdowne, Md. (Industrial Electronics Div.); Chicago, Ill. (Manufacturing & Repair Div.); Atlanta, Ga. (Manufacturing & Repair Div.); St. Louis, Mo. (Manufacturing & Repair Div.); Philadelphia, Pa. (Manufacturing & Repair Div.).

**The company's** Sunbury, Pa., plant set the pace for the greatest number of injury-free man-hours worked. There only one disabling injury has occurred in almost 3 years and only nine such injuries have been sustained since the plant opened in 1942—13 million work-hours ago. Mr. Lippman classifies a "disabling injury" as one which prevents the worker from returning to his job the day immediately following the accident.

Employees of the East Springfield Works turned in a record of

more than 2.5 million man-hours without a disabling injury. Workers at South Philadelphia recorded more than 2 million man-hours without a disabling accident.

The East Springfield plant had 75 pct fewer accidents in 1947 than the average of the preceding 5 years. An improvement of 59 pct was recorded at the Newark Meter Div., while Manufacturing and Repair Div. plants in St. Louis, Philadelphia, Chicago and Atlanta had 50 pct fewer accidents during the year.

Westinghouse officials credit a company-wide accident prevention program for making possible the safety honors.

## Requested Freight Rise Really Double Increase

*Washington*

• • • **The petition** for a general freight rate increase of 8 pct filed last week by the nation's railroads also seeks to increase to higher levels the increases on coal, coke and iron ore requested in a petition to the Interstate Commerce Commission in late August.

In the new petition, the rates on coal, coke, and iron ore would be increased another 5¢ per net ton or 6¢ per gross ton above the amounts proposed on Aug. 28. The requested increases now stand at 30¢ per net ton or 34¢ per gross ton on anthracite and bituminous coal and coke, and 25¢ per ton, net or gross as rated, on iron ore.

The increase in iron ore rates would also be extended to Western territory, except that it would not apply on shipments from the Mesabi Range to Upper Lake Ports.

## Workers Reject A.F.L.

*Middletown, Ohio*

• • • **Employees of the** tubing div., Armco Steel Corp., at Piqua, Ohio, rejected the proposal of the A.F.L. as their exclusive bargaining agent in a National Labor Relations Board election, Sept. 10.

By a count of 59 to 3, the Armco employees indicated their preference for "no union" instead of the A.F.L. All eligible members of the bargaining unit voted. The election was held under the supervision of Paul Weingarten, representative of Cleveland Region, National Labor Relations Board.

## Three Appointed Division Renegotiation Chairmen

*Washington*

• • • **Secretary of Defense** James Forrestal has announced the appointment of the three division chairmen of the Armed Services Renegotiation Board, who constitute the Military Renegotiation Policy and Review Board.

The Policy and Review Board, together with the Armed Services Renegotiation Board which is the operating group, will review profits made on contracts for defense material and services to which the Renegotiation Act of 1948 applies. It will meet in the near future to organize and prepare regulations interpreting the Renegotiation Act and prescribing standards and procedures for determining and eliminating excessive profits under the act.

The members appointed are: Air Force—Frank L. Roberts, who was a member of the Army Price Adjustment Board under the 1943 Renegotiation Act; Navy—Rear Admiral Morton L. Ring, vice chief of naval material, executive office of the Secretary of the Navy, and Army—Brigadier General Ernest M. Brannon, assistant judge advocate general, legal adviser to the assistant secretary of the army on procurement, readjustment and property disposal.

## Forms Technical Council

*Chicago*

• • • **Formation of a** new council for technological advancement has been started here, according to William J. Kelly, president of the Machinery & Allied Products Institute, a research organization.

Basic purpose of the new council is to create a better understanding, among American businessmen and the people in general, of the part technological advance must play in the future development and security of the country.

The council is trying to correct the following erroneous concepts, said Mr. Kelly: (1) That corporation profits are too high, (2) that much of industry's income is invested in plant equipment, (3) that a larger portion of the income of manufacturing corporations should be distributed in dividends, (4) that all loans for

capital equipment should be curtailed and (5) that technology destroys more jobs than it creates.

Mr. Kelly stated that the program was a long range one.

## Sales and Management Problems Will Feature PEI Chicago Meeting

*Washington*

• • • **Plans for solving** the internal problems of the porcelain enameling industry will highlight the porgram of the 17th annual meeting and sales and management conference of the Porcelain Enamel Institute, to be held Oct. 28 and 29 in the Hotel Stevens, Chicago.

The first day's sessions will be devoted to addresses by leading institute members and to general meetings on porcelain enameling methods and executive problems. During the second day, new officers for 1949, and the board of trustees will be elected, and year-end business and proposed amendments to the by-laws will be considered.

Heading the list of speakers will be Ralph F. Bisbee, of Westinghouse Electric Appliance Div., who will speak as general chairman of the new PEI packaging and shipping committee. Recently formed, this committee is working with representatives of railroad, trucking and other carrier associations, and with packaging methods groups, to develop ways and means of reducing freight losses and damage claims on shipments of porcelain enameled products. The committee's organization, function, and methods of approaching this long-standing problem will be the basis of Mr. Bisbee's talk.

**Discussions on the** exploration and promotion of wider markets for porcelain enamel will be conducted by representatives of the market development committee and the commercial research committee.

A feature of the meeting will be a display of old and new porcelain enameled products which are of historic or promotional interest. Arranged by the PEI commercial research committee, this display is expected to furnish a valuable source of new ideas for manufacturers seeking to extend their field of operations.

# Technical Program For National Metal Congress

(CONTINUED FROM PAGE 137)

by M. F. Buck and N. C. Britz, The International Nickel Co., Inc. AIME.

*9:30 A.M.*

**Session No. 1**

*"Distribution of Nonmetallic Inclusions in Some Killed Alloy Steel Ingots,"* by K. L. Fetters, Youngstown Sheet & Tube Co., M. M. Helzel and J. W. Spretnak, Carnegie Institute of Technology. ASM.

*"Some Factors Affecting Subsurface Defects in Large Forging Steel Ingots,"* by E. A. Loria, Mellon Institute of Industrial Research, and H. D. Shephard, Kerchner, Marshall & Co. ASM.

*"Density Variations in Some Killed Steel Ingots,"* by C. F. Sawyer, Vanadium-Alloys Steel Co., and J. W. Spretnak, Carnegie Institute of Technology. ASM.

*"Nature of Inclusions in Tensile Fractures of Forging Steels,"* by H. D. Shephard, Kerchner, Marshall & Co., and E. A. Loria, Mellon Institute of Industrial Research. ASM.

**Session No. 2**

*"Fractographic Examination of Tungsten,"* by C. A. Zapffe and F. K. Landgraf, Baltimore. ASM.

*"Effect of Orientation on Knoop Hardness of Single Crystals of Zinc and Silicon Ferrite,"* by F. W. Daniels and C. G. Dunn, General Electric Co. ASM.

*"Effect of Single Addition Metals on the Recrystallization, Electrical Conductivity and Rupture Strength of Pure Aluminum,"* by R. H. Harrington, General Electric Co. ASM.

*"Forming and Heat Treatment of Corrugated Diaphragms,"* by R. I. Jaffee, E. I. Beidler and R. H. Ramsey, Battelle Memorial Institute. ASM.

**Ship Structure Research**

*"Explosion Tests,"* by G. S. Mikhalapov, Air Reduction Sales Co. AWS.

*"Fracture Characteristics of Ship Plate in Small Scale Tests,"* by E. P. Klier, F. C. Wagner and M. Gensamer, The Pennsylvania State College. AWS.

*"Axial Tension Impact Tests of Structural Steel,"* by W. H. Bruckner and N. M. Newmark, University of Illinois. AWS.

**Railroad**

*"Diesel Locomotive Welding,"* by R. L. Rex, Air Reduction Sales Co. AWS.

*"Submerged Melt and Inert Gas Shielded Electric Welding Ap-*

*plied to Railroad Cars,"* by C. R. Strutz, The Oxweld Railroad Service Co. AWS.

"*Welding Practice in Welding AISI Specification 430 (18 Pct Chrome Steel) in Locomotive Fire Box Applications,*" by Howard L. Miller, Republic Steel Corp. AWS.

**High Alloys-Nonferrous**

"*Effect of Weld Metal Composition on the Strength and Ductility of 15 Pct Gr-35 Pct Ni Welds,*" by David Rozet, H. C. Campbell and R. D. Thomas, Jr., Arcos Corp. AWS.

"*Use of Alloy and Welding in High Temperature Service in Oil and Gas Processing,*" by M. E. Holmberg, Phillips Petroleum Co. AWS.

"*Stress Corrosion in Naval Brass,*" by Bela Ronay, U. S. Navy Engrg. Experiment Station. AWS.

"*Effect of Residual Compression on the Fatigue of Notched Aluminum Alloys,*" by D. Rosenthal, G. Sines and G. Zizicas, University of California. AWS.

**2:00 P.M.**

**Plastic Deformation (Continued)**

"*Plastic Deformation of Large Grained Copper Specimens,*" by W. R. Hibbard, Jr., Yale University. AIME.

"*Plastic Flow in Anisotropic Sheet,*" by L. R. Jackson and K. F. Smith, Battelle Memorial Institute, and W. T. Lankford, Carnegie-Illinois Steel Corp. AIME.

"*Flow and Fracture Characteristics of the Aluminum Alloy 24ST After Alternating Tension and Compression,*" by S. I. Liu and G. Sachs, Case Institute of Technology. AIME.

"*Effect of Thermal-Mechanical History on the Strain Hardening of Metals,*" by J. E. Dorn, A. Goldberg and T. E. Tietz, University of California. AIME.

**Rod and Wire Production Practice (Continued)**

"*Production of Copper and Copper-Alloy Rods and Wire by Rolling and Drawing,*" by P. H. Kirby, American Brass Co. AIME.

"*Production of Copper-Base Alloy Rod by Hot Extrusion,*" by W. D. France and L. E. Thelin, Scovill Mfg. Co. AIME.

"*Fabrication of Aluminum and Aluminum-Alloy Rod, Bar and Wire,*" by W. T. Ennor, Aluminum Co. of America. AIME.

"*Production of Magnesium-Alloy Rod and Wire,*" by G. Ansel, Dow Chemical Co. AIME.

"*Microstructure and Mechanical Properties of Cast Steels,*" by M. F. Hawkes and B. F. Brown, Carnegie Institute of Technology. ASM.

"*Effect of Vanadium on the Prop-*

*erties of Cast Carbon and Carbon-Molybdenum Steels,"* by N. A. Ziegler, W. L. Meinhart and J. R. Goldsmith, Crane Co. ASM.

*"Mechanical Properties, Including Fatigue, of Aircraft Alloys at Very Low Temperatures,"* by J. L. Zambrow and M. G. Fontana, Ohio State University. ASM.

*"Influence of Low Temperature on the Mechanical Properties of 18-8 Chromium-Nickel Steel,"* by D. J. McAdam, Jr., G. W. Geil and Frances Jane Cromwell, National Bureau of Standards. ASM.

### Ship Structure Research

*"Development of Weldable High Strength Steels,"* by C. E. Sims and H. M. Banta, Battelle Memorial Institute. AWS.

*"Testing of Highly Restrained Welded Structural Joints Made from High Strength Steel,"* by A. Boodberg and E. R. Parker, University of California. AWS.

*"Evaluation of Notch Sensitivity Characteristics of Steel by the Tear Test Method and Its Application,"* by N. A. Kahn and E. A. Imbembo, New York Navy Yard. AWS.

### Brazing and Metallizing

*"Low Temperature Silver Alloy Brazing Copper Beryllium Alloys,"* by A. M. Setapen and W. D. Warren, Handy & Harman. AWS.

*"Metallizing as a Production Process,"* by K. B. Smith, Dix Engineering Co. AWS.

### Cutting

*"Powder Cutting and Scarfing in the Steel Industry,"* by F. A. Snyder, Carnegie-Illinois Steel Corp. AWS.

*"A Method of Controlling Cutting Tip Clearance,"* by R. B. Steele and H. G. Hughey, Air Reduction Sales Co. AWS.

*"Stability of Oxyacetylene Flames,"* by L. D. Conta, Air Reduction Sales Co. AWS.

### Open Meeting—Railroad (AWS)

## Wednesday, October 27

### 9:30 A.M.

### Resistance Welding

*"Resistance Welding Characteristics of the Dry Disc Rectifier Welder,"* by R. H. Blair and C. E. Smith, The Taylor-Winfield Corp. AWS.

*"Importance of Temperature Measurements in the Establishment of Optimum Flash Welding Conditions,"* by R. M. Curran, P. Patriarca and W. F. Hess, Rensselaer Polytechnic Institute. AWS.

*"Resistance Welding Cross Wires,"* by R. C. Jones, The Taylor-Winfield Corp. AWS.

## METAL CONGRESS

*"Preliminary Test of Spot Weld Shunting in 24 ST Alclad,"* by A. R. Hard, State College of Washington. AWS.

### Arcs and Electrodes

*"Arc Phenomena with Electrodes Moving at High Speeds,"* by W. B. Kouwenhoven, Dean of School of Engineering, and T. B. Jones, Asst. Prof. E. E., Johns Hopkins University. AWS.

*"An Investigation of Methods for Evaluating Welding Arc Stability and Their Application,"* by Prof. R. A. Wyant, L. P. Winsor, and L. M. Schetky, Rensselaer Polytechnic Institute. AWS.

*"Comparative Behavior of Mild Steel Welds Made with E 6010 and E 6016 Electrodes,"* by F. W. Daniels, F. S. Gardner and R. M. Rood, General Electric Co. AWS.

### Weldability

*"Strain Aging in Welding Low Carbon Structural Steel,"* by W. H. Bruckner and W. E. Ellis, University of Illinois, AWS.

*"Influence of Chemical Composition of the Base Metal Upon the Performance of Metal-Arc Welded Joints,"* by J. Heuschkel, Westinghouse Electric Corp., Research Labs., Welding Section. AWS.

*"Notch Toughness of Welded Low Carbon Steels,"* by E. F. Nippes, Jr., and W. F. Savage, Rensselaer Polytechnic Institute. AWS.

*"Weldability of Cast Carbon and Alloy Steels,"* by Sidney Low and V. T. Malcolm, Chapman Valve Mfg. Co. AWS.

*"Possible Industrial Applications of Soft Radiation—10 to 100 Kv,"* by E. D. Trout, General Electric X-Ray Corp. Non-Destructive Testing.

*"Installation of and Adjustments to a Mobile Betatron,"* by D. T. O'Connor, U. S. Naval Ordnance Laboratory. Non-Destructive Testing.

*"Field Processing of Radiographic Films Where Water Supply Is at a Premium,"* by R. G. Tobey, Eastman Kodak Co. Non-Destructive Testing.

*"Experimental Work Employing Radioisotopes Cobalt and Selenium,"* by D. M. McCutcheon, Ford Motor Co. Non-Destructive Testing.

### *10:00 A.M.*

Annual Meeting, American Society for Metals.

Edward de Mille Campbell Memorial Lecture, by Morris Cohen, Mass. Institute of Technology.

### *2:00 P.M.*

Diffusion and Surface Phenomena

*"Diffusion of Carbon in Austenite with a Discontinuity in Com-*

*position,"* by L. S. Darken, U. S. Steel Corp. AIME.

*"An Electron Diffraction Study of Oxide Films Formed on Nickel-Chromium Alloys,"* by J. W. Hickman and E. A. Gulbransen, Westinghouse Research Laboratories. AIME.

*"An Electron Diffraction Study of Oxide Films Formed on Copper-Nickel Alloys at Elevated Temperatures,"* by J. W. Hickman and E. A. Gulbransen, Westinghouse Research Laboratories. AIME.

*"Decarburization of Chrome Nickel Alloys by Their Surface Oxides in High Vacua and at Elevated Temperatures,"* by E. A. Gulbransen, W. S. Wysong and K. Andrew, Westinghouse Research Laboratories. AIME.

### Transformation

*"Effect of Chromium on the Ms Point,"* by J. B. Bassett and E. S. Rowland, Timken Roller Bearing Co. AIME.

*"Kappa Eutectoid Transformation in the Copper-Silicon System,"* by W. R. Hibbard, Jr., G. H. Eichelman, Jr., and W. P. Saunders, Yale University. AIME.

*"Stabilization of the Austenite-Martensite Transformation,"* by W. J. Harris, Jr., Naval Research Laboratory, and M. Cohen, Mass. Institute of Technology. AIME.

*"Secondary Hardening of Tempered Martensitic Alloy Steel,"* by W. Crafts and J. L. Lamont, Union Carbide and Carbon Research Laboratories, Inc. AIME.

*"Basic Reasons for Good Machinability of 'Free Machining' Steels,"* by M. E. Merchant and N. Zlatin, Cincinnati Milling Machine Co. ASM.

*"An End Quenched Bar for Deep Hardening Steels,"* by Gerrit DeVries, U. S. Naval Proving Ground. ASM.

*"Transverse Mechanical Properties in Heat Treated Wrought Steel Products,"* by Cyril Wells and R. F. Mehl, Carnegie Institute of Technology. ASM.

*"Residual Stresses and Microstructure in Hollow Cylinders,"* by H. B. Wishart and R. K. Potter, Carnegie-Illinois Steel Corp. ASM.

### Cutting

*"Specialized Steel Mill Cutting Machines and Controls,"* by R. F. Helmkamp and A. H. Yoch, Air Reduction Sales Co. AWS.

*"Corrosion Resistance of Powder-Cut Stainless Steels,"* by L. E. Stark and C. R. Bishop, Union Carbide and Carbon Research Laboratories, Inc. AWS.

*"Structural I-Beam Cut-Off Ma-*

*chine,"* by G. J. Strate, Air Reduction Sales Co. AWS.

### Inert Gas Welding

*"Effect of DC Component in AC Inert-Gas Arc Welding of Aluminum,"* by G. J. Gibson and G. R. Rothschild, Air Reduction Sales Co. AWS.

*"Design Features of Inert-Gas-Shielded Arc Welding and Control Equipment,"* by N. E. Anderson, Air Reduction Sales Co. AWS.

*"Effect of Wave Shape in Inert Arc Welding Circuits,"* by R. W. Tuthill, General Electric Co. AWS.

### Resistance Welding

*"Thermal Resistance of Metal Contacts,"* by W. B. Kouwenhoven and J. H. Potter, The Johns Hopkins University. AWS.

*"Projection Welding,"* by W. F. Hess, Rensselaer Polytechnic Institute. AWS.

*"Spotwelding Schedules for Nickel and Nickel Alloys,"* by F. G. Harkins, Solar Aircraft Co. AWS.

*"High-Speed Cine Radiography,"* by C. W. Slack and L. F. Ehrke, Westinghouse Electric Corp. Non-Destructive Testing.

*"Gamma Radiography of Bronze Castings,"* by H. F. Taylor, Mass. Institute of Technology. Non-Destructive Testing.

*"Radiographic Examination of Abrasive Wheels,"* by M. J. Johnson, The Carborundum Co. Non-Destructive Testing.

*"Non-Destructive Testing of Oil Well Drill Pipe,"* by R. C. McMaster, Battelle Memorial Institute. Non-Destructive Testing.

## Thursday, October 28

### *9:30 A.M.*

Session No. 1

*"Resistance to Sensitization of Austenitic Chromium-Nickel Steels of 0.03 Max. Carbon Content,"* by W. O. Binder and C. M. Brown, Union Carbide and Carbon Research Laboratories, and Russell Franks, Electro Metallurgical Co. ASM.

*"Mechanism of the Rapid Oxidation of High-Temperature, High-Strength Alloys Containing Molybdenum,"* by W. C. Leslie and M. G. Fontana, Ohio State University. ASM.

*"Stabilization of Austenitic Stainless Steel,"* by S. J. Rosenberg and J. H. Darr, National Bureau of Standards. ASM.

*"Delta Ferrite Formation and Its Influence on the Formation of Sigma Phase in a Wrought Heat Resisting Steel,"* by J. J. Gilman, Illinois Institute of Technology, Pun Kien Koh, Allegheny Ludlum Steel Corp.,

and Otto Zmeskal, Illinois Institute of Technology. ASM.

### Session No. 2

*"Indium-Bismuth Phase Diagram,"* by E. A. Peretti and S. C. Carapella, Jr., University of Notre Dame. ASM.

*"Manganese-Zinc Phase Diagram from 0 to 50 Pct Zinc,"* by E. V. Potter, U. S. Navy Electronics Laboratory, and R. W. Huber, Bureau of Mines. ASM.

*"Dilatometric Effects of Hardening and Recrystallization in the 60 Copper, 20 Nickel, 20 Manganese Alloy,"* by C. H. Samans, C. C. Brayton, H. L. Drake and L. Litchfield, American Optical Co. ASM.

*"Beta Laminations in Cartridge Brass,"* by R. L. Dowdell, University of Minnesota, C. A. Nagler, Wayne University, M. E. Fine, Bell Telephone Laboratories, H. P. Klug, Mellon Institute of Industrial Research, and Gust Bitsianes, University of Minnesota. ASM.

### Structural

*"Welded Bridges,"* by LaMotte Grover, Air Reduction Sales Co. AWS.

*"Fabrication of Structural Steel Section by Submerged Melt Welding,"* by J. W. Tippett, The Linde Air Products Co. AWS.

*"Flexible Beam and Girder Connection in a Large Welded Structure,"* by H. Greaves, Atlantic Refining Co. AWS.

*"Plastic Behavior of Wide Flange Beams,"* by W. H. Luxion and B. G. Johnston, Firtz Engineering Laboratory, Lehigh University. AWS.

### Inert Gas Welding

*"Practical Aspects of the Inert Gas Shielded Arc Welding Process,"* by A. N. Kugler and H. A. Huff, Jr., Air Reduction Sales Co. AWS.

*"Welding Pure Copper for Pressure Vessels to ASME U69 and Case 934 with Heliarc Process,"* by John W. Mortimer, Whitlock Mfg. Co. AWS.

*"Production Heliwelding Stainless Steel,"* by N. A. Blickman, S. Blickman, Inc. AWS.

*"Inert-Gas-Shielded Spot Welding,"* by F. J. Pilia, The Linde Air Products Co. AWS.

### Maintenance

*"Diversified Welding in Chemical Plant Maintenance,"* by E. M. Ratcliff, Ethyl Corp. AWS.

*"Welding in Steel Mill Maintenance,"* by L. P. Elly, Bethlehem Steel Co. AWS.

*"What a Maintenance Department Can Do with Welding and Cutting,"* by Jamison Moore, Union Bag & Paper Co. AWS.

*"Non-Destructive Testing and Its Place in the Current and Prospective Navy Programs,"* by Henry H. Fox, Comd'r, USN,

Bureau of Ships. Non-Destructive Testing.

"*New Testing Methods for Ceramic Products,*" by C. E. Betz, Magnaflux Corp. Non-Destructive Testing.

"*A Universal Exposure Calculator for Radium Radiography,*" by N. A. Kahn, E. A. Imbembo and Jay Bland, N. Y. Naval Shipyard. Non-Destructive Testing.

### 2:00 P.M.

"*Aging in Gas Turbine Type Alloys,*" by N. J. Grant, and J. R. Lane, Mass. Institute of Technology. ASM.

"*Nickel-Base Alloys for High-Temperature Applications,*" by A. G. Guy, North Carolina State College. ASM.

"*Short-Time High-Temperature Deformation Characteristics of Several Sheet Alloys,*" by J. Miller and G. Guarnieri, Cornell Aeronautical Laboratory. ASM.

"*Stability of Steels at Elevated Temperatures,*" by A. B. Wilder and J. O. Light, National Tube Co. ASM.

### 1948 Mehl Lecture

"*Supersonic Reflectoscope, An Instrument for Non-Destructive Testing and Measuring by Means of Sound Waves,*" by Dr. Floyd A. Firestone. Annual meeting of the Society for Non-Destructive Testing.

## Friday, October 29

### 9:30 A.M.

"*Application of the Theory of Diffusion to the Formation of Alloys in Powder Metallurgy,*" by Pol Duwez and C. B. Jordan, California Institute of Technology. ASM.

"*Thermodynamics in the Decarburization of Steel with Mill Scale,*" by W. A. Pennington, Carrier Corp. ASM.

"*Cause and Cure of Inverse Chill and Hard Spots in Cast Iron,*" by C. A. Zapffe and R. L. Phebus, Baltimore. ASM.

"*Some Wetting Properties of Metal Powers,*" by B. Kopelman and C. C. Gregg, Sylvania Electric Products, Inc. ASM.

#### Automatic Welding

"*Automatic Submerged Arc Welding of 1-In. Alloy Steel Plates,*" by H. L. Miller, Republic Steel Corp. AWS.

"*Production Tooling for Automatic Welding,*" by C. C. Peck, Cecil C. Peck Co. AWS.

#### Miscellaneous

"*Ceramic and Composite Back-Ups for Grooved Weld Joints,*" by C. R. Austin and P. J. Rieppel, Battelle Memorial Institute. AWS.

"*All Welded Fabrication of Shipping Containers by Resistance*

*and Fusion Methods,"* by G. J. Green and D. H. Marlin, Dravo Corp. AWS.

*"Future Welded Design of Farm Equipment,"* by E. J. Koop, Ernest J. Koop Welding and Blacksmith Shop. AWS.

**Hard Facing and Flame Hardening**

*"Economies of Hard Facing,"* by J. J. Barry and Albert Muller, Air Reduction Sales Co. AWS.

*"Hard Facing and Surfacing with the Inert-Gas-Shielded Arc Welding Process,"* by K. H. Koopman, The Linde Air Products Co. AWS.

*"Flame Hardening Methods and Techniques,"* by J. R. Burg, The Baldwin Locomotive Works. AWS.

**2:00 P.M.**

*"A Versatile Vacuum Fusion Apparatus,"* by M. W. Mallett, Battelle Memorial Institute. ASM.

*"Abrasion Resistance of Metals,"* by R. D. Haworth, Jr., Armour Research Foundation. ASM.

*"Solder Flow Tester for Tin Plate,"* by J. J. Sperotto, American Can Co. ASM.

*"Nature and Detection of Grinding Burn in Steel,"* by L. P. Tarasov and C. O. Lundberg, Norton Co. ASM.

## Students at Open House

*Youngstown*

• • • **Special invitations** were extended to high school seniors and juniors in the Youngstown district to attend the Youngstown Sheet & Tube Co.'s Open House Day, held recently.

Company representatives visited more than a score of high schools, outlining the open house program and providing tickets for students.

Special exhibits were arranged in the various departments, and posters prepared to identify raw materials used in steelmaking and machinery in the various processes.

## Ask Nine Mile Railroad

*Dallas, Tex.*

• • • **The Texas** Northern Railway Co., a Texas corporation wholly owned by Lone Star Steel Co., has made application to the ICC for a permit to operate a railroad. The railroad was formerly operated as a unit of the steel plant itself. The line they wish to operate as a separate railroad is nine miles long and connects with the Louisiana and Arkansas Railway.

## European Letter

(CONTINUED FROM PAGE 176)

The forum to which the Western Powers are appealing is primarily public opinion in their own countries and in Germany. The record of the Moscow talks proves beyond doubt that one side wished for a settlement and the other did not. The publicity which a full debate in the Security Council, and later perhaps in the General Assembly, will give to this fact can only be welcomed by the Western Powers.

There are, however, no grounds at all for complacency. It is not to be expected that the Russians will leave their opponents in the untroubled enjoyment of a watertight case. They, too, in effect, are appealing to the same forum; the chief objective of their propaganda is the peoples of the West and in particular, of Germany. It is already clear that the front on which they wish to fight is not the narrow issue of Berlin but the wider one of world peace. The main line of the Russian offensive has already been laid down—in Mr. Vyshinsky's plea for the immediate reduction of all armaments by one third, in the proposals put forward by the Russians, and echoed by Mr. Wallace, for a general withdrawal of troops from Europe, in the passionate advocacy of peace and the equally passionate attacks on the American "warmongers," which pour from Communist centers all around the world. The Russian tactic is to capture the leadership in every country of all the weary, frightened, distracted human beings who long for peace, and to use their horrified rejection of war as a means to prevent, in the West, the measures of rearmament which constant Russian provocation has made necessary.

The Western Powers' good conscience will not by itself be a sufficient answer to this Russian line. They must at all costs avoid the appearance of being on the defensive and of rejecting Russia's plans for peace. The fact that the move is an impertinent swindle does not alter its appeal. Men and women everywhere shrink from the black fury of atomic war. The French are passionately anxious, by almost any means, to return to the ways of compromise and negotiation. Even the freely elected German *Magistrat* in Berlin has put in

a plea for the withdrawal of all troops from Germany. It is dangerously negative to reject the "peaceable" proposals of the Russians on the ground that they are insincere, without at least proving their insincerity. It would be far better to accept them in principle and propose instant clarification of the methods whereby they can be honestly and securely carried out. Will the Russians, for instance, accept immediate inspection of all their arms, plants and depots? Will they withdraw not only their troops from Eastern Germany but their police agents as well? Will they disband the Communist police force? Will they accept elections supervised by a very large body of neutral guards and inspectors? In every case, the meaning of the Russian proposals must be brought into the open and the onus of refusal thrust back upon the Soviet spokesmen. Otherwise, the danger will remain that, in the course of the great public debate on Berlin which is about to open, the Communists may yet be able to turn a bad case into a propaganda victory.

INDEED, the Western Powers should not resist the Russian attempt to widen the debate from the particular to the general. Rather, they should welcome it, for it is on that general plane that they can build up their own confidence, and the world's confidence in them. At Yalta, as is now apparent, the Western Allies blundered into a position in Berlin that was always unwise and is now clearly revealed to the whole world to be a trap. In Berlin, it cannot be denied that the West is in a tight corner. If the Berlin issue continues to occupy the center of the stage, Western diplomacy in general will similarly be forced on to the defensive. But on the wider issue of the cold war between East and West, the West is not on the defensive, it is not in a tight corner, it does not hold a poor hand. Quite on the contrary, so long as the issue is seen clearly, as it now is, there is a definite policy to pursue which holds out real hope of delivering the world from the nightmare of Communist aggression—and of doing so without bloodshed. The line of the Iron Curtain can be held in the cold war, and if it is held in firm strength, there is no doubt at all which side will prove in the end to be the stronger.

## EUROPEAN LETTER

To this general proposition Berlin is an exception, a difficult and dangerous exception, admittedly, but still a special case. It must, of course, be pursued, and the Western Powers had no option but to refer it to the United Nations. But there is nothing to be gained, and a great deal to be lost, by treating it as if it were an epitome of Soviet-Western relations, and reposing all hopes for the wider issue on success in the narrower. For the United Nations' handling of the Berlin issue will certainly be inconclusive. Discussion and debate, whether in Moscow or Paris, do nothing to modify Russia's stranglehold on Berlin. No resolutions in the Security Council, no recommendations in the Assembly will let through one Western train or reopen a single road to the city. The actual physical situation today is what it was the day the airlift started. In this deadlock, every local advantage lies with the Russians while they wait for winter and weather and crumbling German morale to do their job for them.

The true course for the Western nations to pursue is to do everything that is necessary to make it clear to everybody that they both can and will defend the present boundaries of the free world, and to prove within those boundaries that their way of life is stronger, richer, and more appealing to men's minds than the doctrine and practices of Soviet Communism. It is on this task that the West will do well to concentrate. The immediate need, now that the Marshall Plan is in working order, is to build up alongside it a similar structure of military strength and political confidence in Western Europe, towards which a significant step has been taken. If this can be driven ahead this winter, while the airlift maintains Berlin, that particular problem may by next spring have shrunk to its proper dimensions.

## Speaks Before AWS & ASM

*Portland*

• • • **Dr. G. Theisinger,** manager of technical plate sales for the Lukens Steel Co., Coatesville, Pa., was speaker at the meeting of the Portland section of American Welding Sociey and the American Society for Metals. His subject was "The Manufacture, Fabrication and Application of Clad Steels."

## Austin Sees Economy Resting on Shoulders Of America's Salesmen

*Pittsburgh*

• • • **When the postwar** boom subsides, much of the responsibility for the continuation of a sound economy will rest on the shoulders of America's salesmen, it was stated recently by David F. Austin, sales vice-president, U. S. Steel of Delaware, at a luncheon meeting of the Sales Executives Club of Pittsburgh.

Mr. Austin developed his premise further by saying that salesmen, as a group, will have more effect upon the permanence of peace than all the diplomats; more effect on wages and prices than all the negotiators. "They will," he continued, "have a profound effect upon such seemingly unrelated things as crime and delinquency, the divorce rate and the death rate, as well as upon the wage rate and the dividend rate."

He explained that unless every salesman in this country, in the years ahead, succeeds in selling the products of the looms, rolling mills, forges, presses, of the farms and mines and factories, ". . . that vision of modern America which our generation holds so closely to its heart will remain a mythical hope based on wishful thinking."

**The U. S. Steel** official reaffirmed the necessity for peak production today, but showed the need for future planning by saying, "We can produce from now until the end of time, and unless we sell the output, the result will be an unhealthy inventory and a sales-liquidation problem entailing frightful losses. *This* is *not* a visionary picture; it has happened often and it can happen again."

In discussing the retreating domination of business by engineering, manufacturing and financial considerations and the growing emphasis on merchandising, he pointed out that it is much more important for a business to own a market than a mill.

"Anyone with capital," he continued, "can erect the nearly perfect source of supply. This is a tangible asset; but unless the product can be sold at a profit, the physical property represented by the producing unit will, overnight, become a heavy liability."

# ECA Funds, Free Equipment Choice Held Key to Tool Releases

• • • **Keys to the** release of $100 million in machine tool orders in Europe are direct use of ECA funds and freedom of choice for the private European buyer, A. G. Bryant, president, National Machine Tool Builders' Assn., told a press conference in Cleveland last week.

Mr. Bryant, president, Bryant Machinery & Engineering Co., and vice-president, Cleereman Machine Tool Co., returned recently from an extensive tour of the major European machine tool markets.

"Arbitrary dictation by governments participating in ECA must not take the place of sound judgment and experience of competent industrialists in these countries," he declared.

"When a private businessman is prepared to advance his own funds in his own national currency, to purchase a machine best suited to his requirements, that should serve as the acid test as to whether such a purchase is sound, not only from the standpoint of the user, but in the interest of his nation's economy," Mr. Bryant said.

**He added that** such a purchaser should then be allowed freedom of choice to select that piece of equipment that will best do his work, regardless of where the machine is manufactured.

He charged that local European governments have not included requests for allotments for machinery in schedules for allotments under ECA and now only under the insistent prodding of their own industrialists have they belatedly started to request necessary appropriations.

Mr. Bryant also charged that the United States was not using its influence to direct the proper use of ECA funds, adding that "we should insist that governments receiving aid accept proper apportionments of recovery facilities."

"We should require, when necessary, that countries being helped also accept our guidance in the allocation of funds."

In Mr. Bryant's opinion, the outlook for a speedy solution to this situation as it concerns the average U. S. machine tool builder is disheartening.

### Arbitrary Dictation by Some Governments Should Not Replace Judgment

° ° °

**He pointed out** that in some cases, ECA funds were being used to purchase European or British machine tools.

He added that some of these machines were "pretty good," but in many cases delivery is one year. Foreign machine tools are generally lower in price than U. S. and in many cases, this gets the business. In other cases, a foreign manufacturer may wish to buy U. S. machine tools, but lacking dollars and having sterling, the order goes to a British builder.

Elsewhere, on the domestic front, the machine tool business is spotty. Some of the defense programs are producing inquiries for thread milling equipment, special gages, special purpose milling machines, but generally demand is down. Lathes are moving fairly well in most major sales sectors. Few of the aircraft tooling programs have borne fruit thus far. Requirements are screened against JANMAT reserves, and bulk of the requirements are filled from this source, according to reports from various sectors.

**In Detroit,** some interesting machine tool developments were reported during the past week. Several placements in the Saginaw transmission were reported, indicating that the total value of the entire program for Chevrolet's automatic transmission, including special equipment, may well exceed $1.5 million. There were also indications that tooling by the Detroit Gear Div. of Borg Warner will shortly get under way as new quotations are being requested from several Detroit machine tool sources. This is believed to be the Ford automatic transmission. In addition, several placements for the Packard transmission have been reported, indicating this program has also been given the green light.

Some product improvement and replacement of machines has been reported by Buick.

With rearmament developments growing in importance every day, it is reported that a large manufacturer in this district has been asked to replace by early Spring 2000 pieces of equipment which had been under government lease. If similar developments occur on a large scale, it is expected that interest in new equipment here will be at somewhat higher levels than at present.

**In Philadelphia,** dealers and company representatives are waiting for Westinghouse Electric Corp. to begin placing orders for the multimillion jet engine plant here. Also, there is the Bureau of Ships' $2 million program for standby tools that will be warehoused until an emergency, according to reports.

## Installs Catalytic Unit

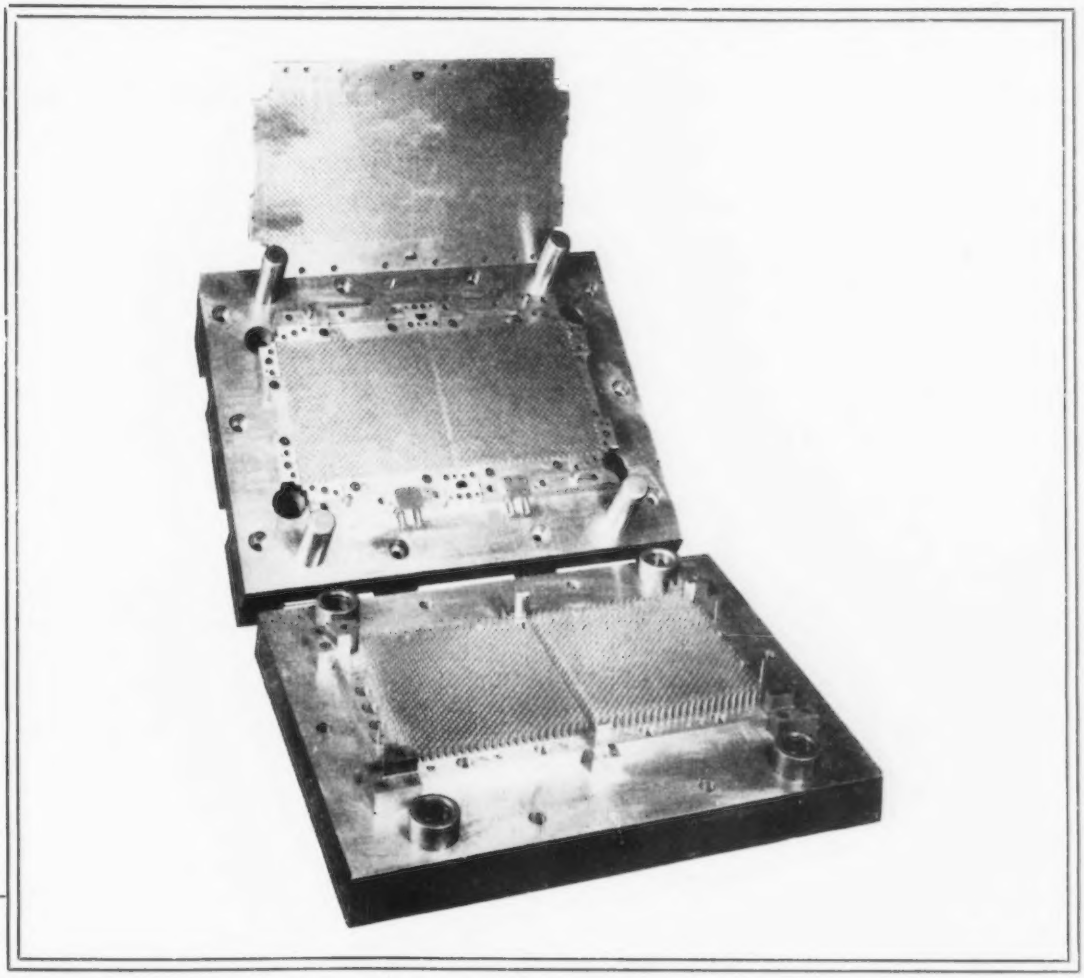
*Philadelphia*

• • • **Brig. Gen.** David N. Hauseman, president of Houdry Process Corp., disclosed recently that the Petco Corp. will install a Houdriflow Catalytic Cracking Unit at its Blue Island, Ill., refinery. The new Houdriflow Process is an improved design of the Thermofor Catalytic Cracking (TCC) process which was originally developed by the Socony Vacuum Oil Co. One of the outstanding changes in the process is its employment of a gas lift for circulating the catalyst instead of the previously used mechanical elevators.

Signing of the contracts with Houdry Process Corp. as licensors, and with Clark's Construction & Engineering Co. of Milwaukee, as contractors, was announced by A. M. Paine, president of Petco Corp.

# FOR MORE PROFITABLE PRODUCTION

## *Precision Ground Sectional Dies*



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# NONFERROUS METALS

. . . News and Market Activities

## Aluminum, Antimony and Brass Ingot Prices are Increased

*New York*

• • • **Increases in the** prices of aluminum, antimony and brass ingots were the most significant developments of the week from the standpoint of consumers. The Aluminum Co. of America announced a price increase of 1¢ per lb for virgin ingots and pigs, bringing them to 17¢ and 16¢, respectively. These prices are now uniform with those of the other two producers of primary aluminum. However, they are relatively insignificant when compared with going prices for secondary aluminum ingots that are selling at 8¢ to 10¢ per lb higher.

Fabricators of aluminum will pay more for Alcoa finished products effective Oct. 11. So far the new price schedules have not been made available for publication, but early information indicates that the price increases may serve to bring Alcoa prices into line with the somewhat higher prices of competitive mills. The Alcoa price action supplements previous increases taken at the end of June.

National Lead Co. and St. Joseph Lead Co. raised the price of antimony by 3½¢ per lb during the week. This brings the price of the metal to 38½¢ per lb f.o.b. Laredo, Tex. Increasing costs were stated to be the cause of the price increase which originated with the largest producer. One factor in the cost structure is the recent increase of 15 pct in the Mexican export tax which is now being paid for ores and concentrates. Delivered to Jersey City, N. J. at a price of 41.67¢, this figure approaches the all time high of 45¢ per lb at New York reached in 1915.

### Aluminum Finished Products Are Also Scheduled For Increase in Price

o o o

The OPA ceiling price was held during the war at 14.50¢ at Laredo.

On Oct. 11 a Philadelphia producer of brass and bronze ingots raised prices by ½¢ per lb for red metal ingots and ¾¢ for yellow ingots. The action was required by a stiffening of the scrap market, but the ingot market is still plagued by inactivity. Prices of this producer are still well below published prices of competitors, but these do not reflect going market prices.

Both producers and consumers of metals are speculating quietly on the impact on the metal markets of the Washington stockpiling meetings for copper, lead, zinc, and several minor metals which began this week. So far as can be learned all factors in the metal industry are still in the dark as to the implications of the meetings. It is generally believed that the principal purpose of the meetings is to set up a program on a voluntary basis for monthly allotments of strategic metals for the stockpile. It is understood that some government officials concerned with the stockpiling program are dissatisfied with the operation of the present program.

Copper producers have opened their books for November deliveries. The tight nearby market is reported being extended by demand into longer term deliveries. The export market has strengthened sharply with the growing activity of the ECA program. Exports for the first quarter are being sold rather freely. Producers look for a heavier export demand for the first half. The British Ministry of Supply entered the world market to buy copper for this year and for the first quarter of 1949. Some brass mill products are still in heavy demand, including tubing and pipe. Enough billets to meet the heavy demand are not obtainable.

The lead market is still in acute short supply, as indicated by the latest increase of ½¢ per lb in the price of scrap. Dealers are buying soft lead scrap in the range of 18¢ to 18½¢ per lb at New York, little more than 1¢ less than the New York delivered price of virgin metal. This high scrap price testifies to the continued activity of the premium secondary metal market. The St. Joseph Lead Co. workers in Missouri held an election last week to determine the collective bargaining agency to represent them. The Ozark Lead Workers' Union received a few less votes than the Coke and Gas Workers' Union. The workers voting for no union exceeded the partisans of either union by some 250 votes. A run off election was held on Oct. 11.

The zinc market is still in short supply and scrap zinc grades are being bought by dealers at an increase of ½¢ per lb.

### Nonferrous Metals Prices

| | Oct. 6 | Oct. 7 | Oct. 8 | Oct. 9 | Oct. 11 | Oct. 12 |
|---|---|---|---|---|---|---|
| Copper, electro, Conn. | 23.50 | 23.50 | 23.50 | 23.50 | 23.50 | 23.50 |
| Copper, Lake, Conn. | 23.625 | 23.625 | 23.625 | 23.625 | 23.625 | 23.625 |
| Tin, Straits, New York | $1.03 | $1.03 | $1.03 | $1.03 | $1.03 | $1.03 |
| Zinc, East St. Louis | 15.00 | 15.00 | 15.00 | 15.00 | 15.00 | 15.00 |
| Lead, St. Louis | 19.30 | 19.30 | 19.30 | 19.30 | 19.30 | 19.30 |

## Canadian Mineral Output For July Shows Increase

*Ottawa*

• • • **For the month** of July, output of all but one of Canada's leading mineral products in July was higher than a year ago. In the first 7 months this year production was increased in all but two items. Copper showed a decline in July, while lead and salt were down in the 7-month period.

## Primary Metals

*(Cents per lb, unless otherwise noted)*

| | |
|---|---|
| Aluminum, 99+%, 10,000 lb, freight allowed | 17.00 |
| Aluminum pig | 16.00 |
| Antimony, American, Laredo, Tex. | 38.50 |
| Beryllium copper, 3.75-4.25% Be dollars per lb contained Be | $20.50 |
| Beryllium aluminum 5% Be, dollars per lb contained Be | $40.00 |
| Cadmium, del'd | $1.90 |
| Cobalt, 97-99% (per lb) | $1.65 to $1.72 |
| Copper electro, Conn. Valley | 23.50 |
| Copper, lake, Conn. Valley | 23.625 |
| Gold, U. S. Treas., dollars per oz. | $35.00 |
| Indium, 99.8%, dollars per troy oz. | $2.25 |
| Iridium, dollars per troy oz. | $110 to $120 |
| Lead, St. Louis | 19.30 |
| Lead, New York | 19.50 |
| Magnesium, 99.8+%, f.o.b. Freeport, Tex. | 20.50 |
| Magnesium, sticks, carlots | 34.50 |
| Mercury, dollars per 76-lb flask, f.o.b. New York | $75 to $78 |
| Nickel, electro, f.o.b. New York | 42.90 |
| Palladium, dollars per troy oz. | $24.00 |
| Platinum, dollars per troy oz. | $93 to $96 |
| Silver, New York, cents per oz. | 77.50 |
| Tin, Grade A, New York | $1.03 |
| Zinc, East St. Louis | 15.00 |
| Zinc, New York | 15.65 |
| Zirconium copper, 20 pct Zr, per lb contained Zr. | $8.75 |

## Remelted Metals

### Brass Ingot

*(Published prices, cents per lb delivered, carloads)*

| | | |
|---|---|---|
| 85-5-5-5 ingot | | |
| No. 115 | 20.00* | 22.00 |
| No. 120 | 19.50* | 21.50 |
| No. 123 | 19.00* | 21.00 |
| 80-10-10 ingot | | |
| No. 305 | | 27.25 |
| No. 315 | | 24.25 |
| 88-10-2 ingot | | |
| No. 210 | | 33.00 |
| No. 215 | | 31.00 |
| No. 245 | 24.50* | 25.75 |
| Yellow ingot | | |
| No. 405 | 16.50* | 17.50 |
| Manganese bronze | | |
| No. 421 | | 23.00 |

* F.o.b. Philadelphia.

### Aluminum Ingot

*(Cents per lb, lots of 30,000 lb)*

| | |
|---|---|
| 95-5 aluminum-silicon alloys | |
| 0.30 copper, max. | 26.50–27.00 |
| 0.60 copper, max. | 26.25–26.75 |
| Piston alloys (No. 122 type) | 23.50–24.00 |
| No. 12 alum. (No. 2 grade) | 23.00–23.50 |
| 108 alloy | 23.25–23.50 |
| 195 alloy | 23.00–23.50 |
| 13 alloy | 26.00–26.50 |
| AXS-679 | 23.50–24.00 |
| Steel deoxidizing aluminum, notch-bar granulated or shot | |
| Grade 1—95 pct-95½ pct. | 23.75–24.75 |
| Grade 2—92 pct-95 pct. | 23.50–24.50 |
| Grade 3—90 pct-92 pct. | 22.75–23.50 |
| Grade 4—85 pct-90 pct. | 22.50–23.00 |

## Electroplating Supplies

### *Anodes*

*(Cents per lb, freight allowed, in 500 lb lots)*

| | |
|---|---|
| Copper | |
| Cast, oval, 15 in. or longer | 40½ |
| Electrodeposited | 34⅝ |
| Rolled, oval, straight, delivered | 37.34 |
| Ball anodes | 38⅝ |
| Brass, 80-20 | |
| Cast, oval, 15 in. or longer | 35⅞ |
| Zinc, oval, 99.99 | 22.50 |
| Ball anodes | 20.50 |
| Nickel 99 pct plus | |
| Cast | 59.00 |
| Rolled, depolarized | 60.00 |
| Cadmium | $2.00 |
| Silver 999 fine, rolled, 100 oz. lots, per troy oz, f.o.b. Bridgeport, Conn. | 84½ |

### *Chemicals*

*(Cents per lb, f.o.b. shipping point)*

| | |
|---|---|
| Copper cyanide, 100 lb drum | 46.00 |
| Copper sulfate, 99.5 crystals, bbls. | 9.10 |
| Nickel salts, single or double, 100 lb bags, frt. allowed | 18.50 |
| Nickel chloride, 300 lb bbl. | 24.50 |
| Silver cyanide, 100 oz. lots, per oz. | 65 |
| Sodium cyanide, 96 pct domestic 100 lb drums | 16.00 |
| Zinc sulfate, crystals, 22.5 pct, bags | 5.90 |
| Zinc sulfate, 25 pct, granules, bbls. frt. allowed | 7.90 |

## Mill Products

### Aluminum

Note: New prices of Alcoa effective Oct. 11 not yet available.

*(Base prices, cents per pound, base 30,000 lb, f.o.b. shipping point, freight allowed)*

**Flat Sheet:** 0.188 in., 2S, 3S, 25.7¢; 4S, 61S-O, 27.8¢; 52S, 29.9¢; 24S-O, 24S-OAL, 28.8¢; 75S-O, 75S-OAL, 35.3¢. 0.081 in., 2S, 3S, 26.8¢; 4S, 61S-O, 29.2¢; 52S, 31.3¢; 24S-O, 24S-OAL, 29.9¢; 75S-O, 75S-OAL, 37.0¢. 0.032 in., 2S, 3S, 28.5¢; 4S, 61S-O, 32.5¢; 52S, 35.2¢; 24S-O, 24S-OAL, 36.9¢; 75S-O, 75S-OAL, 46.6¢.

**Plate:** ¼ in. and heavier: 2S, 3S, 22.8¢; 4S-F, 25.0¢; 52S, 26.1¢; 61S-O, 25.6¢; 24S-F, 24S-FAL, 26.1¢; 75S, 75S-AL, 32.9¢.

**Extruded Solid Shapes:** Shape factors 1 to 4; 31¢ to 59¢; 11 to 13, 31.9¢ to 69¢; 23 to 25, 33.4¢ to 90¢; 35 to 37, 40.8¢ to $1.25; 47 to 49, 58.7¢ to $1.84.

**Extruded Round Rod, Square, Hex, Octagonal Bar:** ¼ in. and over, 27¢ to 38¢; ½ to ¾ in., 28¢ to 40.5¢; ⅜ to ½ in., 29¢ to 43¢; ¼ to ⅜ in., 30¢ to 46.5¢; 3/16 to 7/32 in., 32.5¢ to 53.5¢; 9/64 to 5/32 in., 35.5¢ to 62¢.

**Rolled Rod:** 1.064 to 4.5 in., 2S, 3S, 33¢ to 29.5¢; Cold-finished rod, 0.375 to 3.5 in., 2S, 3S, 35.5¢ to 31¢.

**Screw Machine Stock:** Drawn, ⅛ to 11/32 in., 11S-T3, R317-T4, 48¢ to 34¢; cold-finished ⅝ to 1½ in., 11S-T3, 37.5¢ to 34.5¢; ⅜ to 2 in., R317-T4, 33¢ to 30¢; rolled, 1 9/16 to 3 in., 11S-T3, 34.5¢ to 31.5¢; 2½ to 3⅝ in., R317-T4, 29.5¢ to 28.5¢. Base 5000 lb.

**Drawn Wire:** coiled, 0.051 to 0.374 in.: 2S, 35¢ to 25.5¢; 52S, 43¢ to 31¢; 56S, 45.5¢ to 37¢; 17S-T4, 49¢ to 33.5¢; 61S-T4, 43.5¢ to 33¢; 75S-T6, 75¢ to 54¢.

### Magnesium

*(Cents per lb, f.o.b. mill, freight allowed Base quantity 30,000 lb)*

**Sheet and Plate:** Ma, FSa, ¼ in., 54¢-56¢; 0.188 in., 56¢-58¢; B & S gage 8, 58¢-60¢; 10, 59¢-61¢; 12, 63¢-65¢; 14, 69¢-74¢; 16, 76¢-81¢; 18, 84¢-89¢; 20, 96¢-$1.01; 22, $1.22-$1.31; 24, $1.62-$1.75. Specification grade higher.

**Extruded Round Rod:** M, diam. in., ¼ to 0.311, 58¢; ½ to ¾, 46¢; 1¼ to 1.749, 43¢; 2½ to 5, 41¢. Other alloys higher.

**Extruded Square, Hex. Bar:** M, size across flats, in., ¼ to 0.311, 61¢; ½ to 0.749, 48¢; 1¼ to 1.749, 44¢; 2½ to 4, 42¢. Other alloys higher.

**Extruded Solid Shapes, Rectangles:** M, in weight per ft, for perimeters of less than size indicated, 0.10 to 0.11 lb. per ft. per. up to 3.5 in., 55¢; 0.22 to 0.25 lb per ft, per. up to 5.9 in., 51¢; 0.50 to 0.59 lb per ft, per. up to 8.6 in., 47¢; 1.8 to 2.59 lb per ft, per. up to 19.5 in., 44¢; 4 to 6 lb per ft, per. up to 28 in., 43¢. Other alloys higher.

**Extruded Round Tubing:** M, wall thickness, outside diam, in., 0.049 to 0.057, ¼ to 5/16, $1.14; 5/16 to ⅜, $1.02; ½ to ⅝, 76¢; 1 to 2 in., 65¢. 0.065 to 0.082, ⅜ to 7/16, 85¢; ⅝ to ¾, 62¢; 1 to 2 in., 57¢. 0.165 to 0.219, ⅝ to ¾, 54.5¢; 1 to 2 in., 53¢; 3 to 4 in., 49¢. Other alloys higher.

### Nickel and Monel

*(Cents per lb, f.o.b. mill)*

| | Nickel | Monel |
|---|---|---|
| Sheets, cold-rolled | 60 | 47 |
| Strip, cold-rolled | 66 | 50 |
| Rods and shapes | | |
| Hot-rolled | 56 | 45 |
| Cold-drawn | 56 | 45 |
| Angles, hot-rolled | 56 | 45 |
| Plates | 58 | 46 |
| Seamless tubes | 89 | 80 |
| Shot and blocks | .. | 40 |

### Copper, Brass, Bronze

*(Cents per pound, freight prepaid on 200 lb)*

| | Extruded Shapes | Rods | Sheets |
|---|---|---|---|
| Copper | 36.78 | .... | 37.18 |
| Copper, hot-rolled | .... | 33.28 | .... |
| Copper, drawn | .... | 34.28 | .... |
| Low brass | 38.07* | 34.85 | 35.16 |
| Yellow brass | 36.76* | 33.44 | 33.75 |
| Red brass | 38.55* | 35.33 | 35.64 |
| Naval brass | 33.92 | 32.67 | 38.61 |
| Leaded brass | .... | 28.30 | .... |
| Commercial bronze | 39.29* | 36.32 | 36.63 |
| Manganese bronze | 37.51 | 36.01 | 42.11 |
| Phosphor bronze, 5 pct | 57.80* | 56.30 | 56.05 |
| Muntz metal | 33.47 | 32.22 | 36.66 |
| Everdur, Herculoy, Olympic, etc. | 40.43 | 40.67 | 41.73 |
| Nickel silver, 10 pct | .... | 46.42 | 44.20 |
| Architectural bronze | .... | .... | 32.33 |

* Seamless tubing.

## Scrap Metals

### Brass Mill Scrap

*(Cents per pound; add 1¢ per lb for shipments of 15,000 or more)*

| | Heavy | Turnings |
|---|---|---|
| Copper | 21⅛ | 20⅜ |
| Yellow brass | 18 | 17⅛ |
| Red brass | 19¾ | 19 |
| Commercial bronze | 19¾ | 19 |
| Manganese bronze | 17¾ | 16⅞ |
| Leaded brass rod ends | 17¾ | |

### Custom Smelters' Scrap

*(Cents per pound, carload lots, delivered to refinery.)*

| | |
|---|---|
| No. 1 copper wire | 20.00 |
| No. 2 copper wire | 19.00 |
| Light copper | 18.00 |
| Refinery brass | 18.00* |

* Dry copper content.

### Ingot Makers' Scrap

*(Cents per pound, carload lots, delivered to producer.)*

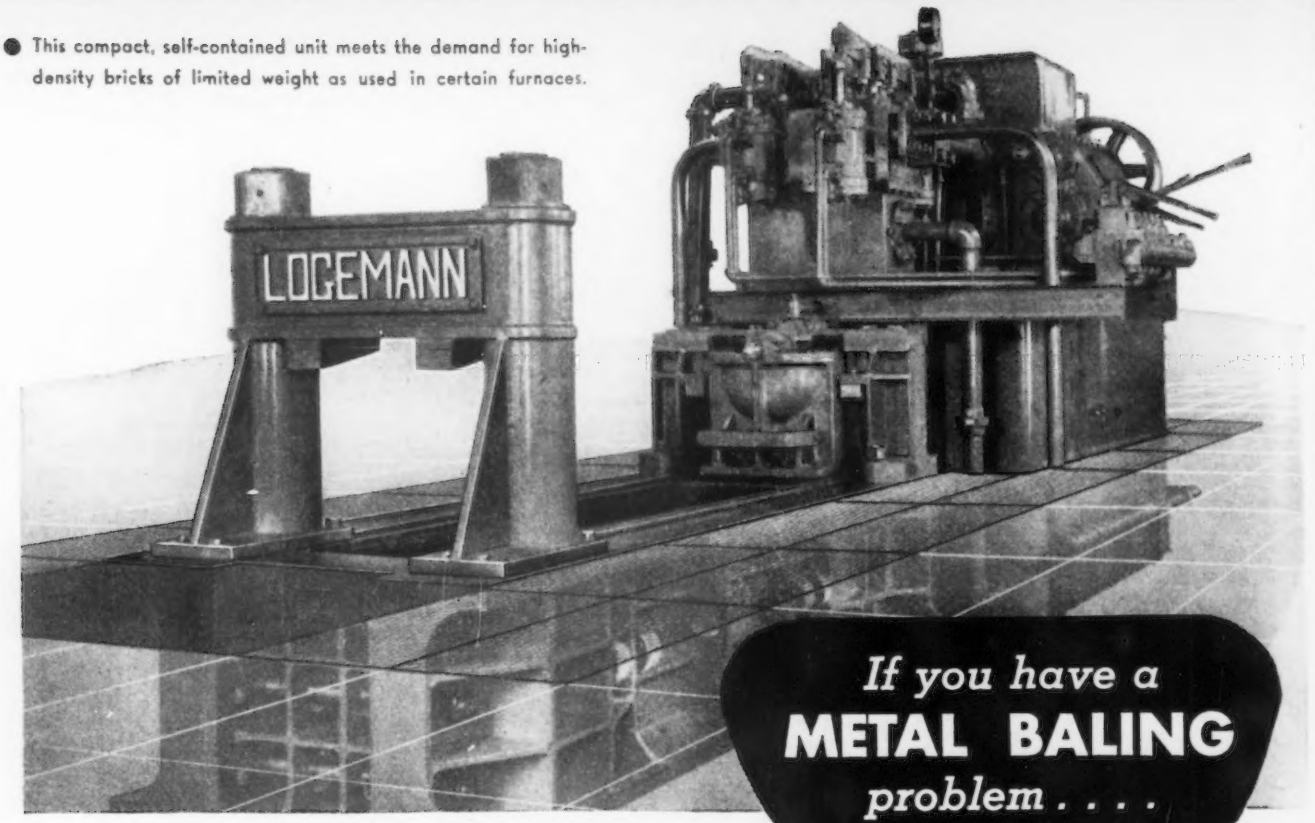
| | |
|---|---|
| No. 1 copper, wire | 19.50 |
| No. 2 copper, wire | 18.50 |
| Light copper | 17.50 |
| No. 1 composition | 16.25 |
| No. 1 comp. turnings | 15.50 |
| Rolled brass | 12.00 |
| Brass pipe | 12.50 |
| Radiators | 13.25 |
| Heavy yellow brass | 11.50 |
| *Aluminum* | |
| Mixed old cast | 12.00 |
| Mixed old clips | 13.00 |
| Mixed turnings, dry | 11.00 |
| Pots and pans | 13.00 |
| Low copper | 14.00 |

### Dealers' Scrap

*(Dealer's buying prices, f.o.b. New York in cents per pound)*

| | |
|---|---|
| **Copper and Brass** | |
| No. 1 heavy copper and wire | 17½—18 |
| No. 2 heavy copper and wire | 16½—17 |
| Light copper | 15½—16 |
| Auto radiators (unsweated) | 11 —11½ |
| No. 1 composition | 13¼—13½ |
| No. 1 composition turnings | 12¾—13 |
| Clean red car boxes | 10½—11 |
| Cocks and faucets | 10½—11 |
| Mixed heavy yellow brass | 8¼— 8¾ |
| Old rolled brass | 9¾—10 |
| Brass pipe | 10½—11 |
| New soft brass clippings | 13¼—14 |
| Brass rod ends | 11 —11½ |
| No. 1 brass rod turnings | 10¼—10¾ |
| **Aluminum** | |
| Alum. pistons and struts | 8 — 8½ |
| Aluminum crankcases | 9½—10 |
| 2S aluminum clippings | 12 —12½ |
| Old sheet & utensils | 9½—10 |
| Borings and turnings | 5 — 5½ |
| Misc. cast aluminum | 9½—10 |
| Dural clips (24S) | 9½—10 |
| **Zinc** | |
| New zinc clippings | 10½—11 |
| Old zinc | 8¼— 8¾ |
| Zinc routings | 4½— 5 |
| Old die cast scrap | 5 — 5½ |
| **Nickel and Monel** | |
| Pure nickel clippings | 22 —23 |
| Clean nickel turnings | 17 —18 |
| Nickel anodes | 22 —23 |
| Nickel rod ends | 21 —22 |
| New Monel clippings | 15½—16½ |
| Clean Monel turnings | 11 —12 |
| Old sheet Monel | 13 —14 |
| Old Monel castings | 10 —11 |
| Inconel clippings | 12 —13 |
| Nickel silver clippings, mixed | 8 — 8½ |
| Nickel silver turnings, mixed | 6½— 7 |
| **Lead** | |
| Soft scrap lead | 18 —18½ |
| Battery plates (dry) | 11¾—12¼ |
| **Magnesium Alloys** | |
| Segregated solids | 8 — 9 |
| Castings | 4½— 5½ |
| **Miscellaneous** | |
| Block tin | 82 —84 |
| No. 1 pewter | 65 —67 |
| No. 1 auto babbitt | 51 —53 |
| Mixed common babbitt | 14¾—15¼ |
| Solder joints | 19¾—20¼ |
| Siphon tops | 50 —52 |
| Small foundry type | 20 —20½ |
| Monotype | 19 —19½ |
| Lino. and stereotype | 18 —18½ |
| Electrotype | 16½—17 |
| New type shell cuttings | 15 —15½ |
| Hand picked type shells | 6½— 7 |
| Lino. and stereo dross | 9½—10 |
| Electro dross | 6½— 7 |

● This compact, self-contained unit meets the demand for high-density bricks of limited weight as used in certain furnaces.




*If you have a*
**METAL BALING**
*problem . . . .*

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**For nearly 75 years, Logemann Brothers Co., have been building Scrap Presses to meet specific conditions.**

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. . . is available to you. Let us help you arrive at the efficient and economical way of handling your scrap regardless of the unusual problems you may present to us. No obligation.

## LOGEMANN BROTHERS CO.

**3164 W. BURLEIGH STREET · MILWAUKEE 10, WISCONSIN**

## Market Unchanged Despite Good Backlogs

*New York*

• • • **There were no price** changes of importance this week despite talk of weakness in some areas. Shipments were off a little due to holidays and mills having a better supply of scrap than they have had for months, but the mills can still use all the good scrap they can get hold of. One mill which has had no access to foreign scrap is pushed for scrap, but the picture as a whole is the best in months.

Cast grades were a little erratic. Heavy breakable went up $1 in Pittsburgh as did machinery cast and automotive cast in Detroit. But the price spread on mixed yard cast narrowed $1 at Detroit to $57 to $59. In addition, difficulty in grading cast iron in Detroit has been encountered. Within recent weeks No. 1 cupola has been dropped in most markets and supplanted with machinery cast and mixed yard cast. Despite this change to better reflect actual market transactions, some foundries are reportedly establishing their own specifications to the product and available equipment. In addition to this, some dealers are reportedly not very particular in segregating the cast scrap grades.

In Cleveland the railroad market was strong. One of the major factors in the market held the heavy melting grade from the market this week. Some segments of the trade are trying to figure this out since the going price is $43 to $43.50 and the material, it is felt, could have gone for around $50.

•

PITTSBURGH—There is still a lot of talk about price weakness. It is still talk, no lower prices have materialized. Specialties, reportedly meeting heavy buyer resistance, still move at the quoted prices. Brokers admit they are not as easy to sell as they were a month ago. One of the big foundry buyers of steel specialties is out of the market, reportedly with stocks enough to carry through the end of the year at least. Buyers can still be found for all scrap grades at current prices despite substantial stocks on the ground at mills. Cast continues strong. The only price change during the week was a $2 advance in heavy breakable cast iron scrap.

•

CHICAGO—Many mills are still out of the market on all dealer scrap. Another mill has held up all shipments for a week or two. It is estimated that on the average the mills in this area have almost 2 months supply of scrap on the ground. This inventory is much better than they have had in past years at this time. New orders are hard to find. Carnegie will issue new orders to brokers when 90 pct of the old orders are shipped. Dealers are having difficulty moving bundles, but this condition may clear up by the time the snow flies.

•

PHILADELPHIA — The scrap market had an easier tone last week with shipments in good volume and the prospect of fairly good imported tonnages. Large tonnages are reported to be in the process of unloading at Girard Point. Mills are reported to be in a very comfortable position and are not pressing for scrap. The cast market is also easier due to reduced foundry operations and some imports of cast scrap. Some mills on the fringe of the district are reported to be testing the heavy melting market at lower prices. No information is available on transactions at lower prices. Prices are unchanged. Rejections are reported growing on light iron.

•

CLEVELAND—Major consumers here and in the Valley anticipate increased shipments with the close of the holiday period. During the past week the market has been rather quiet but strong, and a number of dealers report that they are unable to get much material to handle. Strength of the market was evident in the closing of a major railroad's lists, with cast bringing $75, angle bars $63, rerolling rails $68 and malleable $80. Some segments of the trade are trying to figure out why heavy melting, prepared and unprepared, was withdrawn when it was believed it would bring $50.

•

DETROIT—With prices of openhearth grades holding here at current price levels, the threat of a freight car shortage is the most significant development here in the past week. However, mills are reported to be comfortable for scrap and Ford is buying in only limited grades and quantities according to local sources. Foundry grades continue in active demand. Considerable difficulty about grading of cast iron has developed here with each foundry reportedly establishing its own specs according to the product and available equipment.

•

CINCINNATI—Despite the presence of soft spots here and there, the scrap market here remains strong. Openhearth grades are continuing to hold their own, but on the other hand, some of the dealers are hard put to move material to foundries. One broker is of the opinion that the market may drift lower before it starts on the way up again when consumers will be striving to get as much on the ground as possible before winter.

NEW YORK—There were no price changes this week. Shipments continued to move normally although material moving to the midwest was limited somewhat and rumors of over-the-market sales were less prevalent. Some sources feel that German scrap will taper off some of the demand for domestic scrap, but this others feel is only a temporary situation and that the same demand that has been in existence will persist through the winter, at least.

•

BUFFALO — Market conditions were basically unchanged this week as dealers and mills remained about $2 apart in their ideas of prices. Odd cars of No. 2 scrap were still bringing up to $43.50 in the open market, apparently to clean up old orders. Pittsburgh district buyers continued to pay a $2 springboard downstate, diverting material that otherwise might come here. Foundry specialties were strong at recent high levels.

•

BIRMINGHAM — An extremely tight cast market in this area had become tighter with one blast furnace being blown out for repairs and a second scheduled to be taken off for relining at the end of this month. Considerable tonnages of openhearth material are moving to consumers with supplies adequate for consumption. Prices are unchanged.

•

BOSTON—There is little change in the markets here. Chemical borings remain in demand, No. 1 heavy melting continues to sell from $34.40 to $36.40 and cast grades continue spotty, but high.

•

ST. LOUIS—Although receipts of melting grades are greater than consumption, and mills have substantial inventories, they are continuing to take offerings at present levels. Foundry grades are weaker and several items are lower as inventories are up.

## Increases Ingot Output

*Detroit*

• • • **Rotary Electric** Steel Co. has purchased for $250,000 the buildings and equipment built during the war to increase its production of alloy steel ingots. The purchase was announced by the War Assets Administration.

Included in the equipment is a so-called Blastola designed for duplexing operations in steelmaking. According to a company spokesman, this equipment was never successfully integrated with steel production at Rotary. This equipment will be dismantled it was learned.

The purchase also includes an extension to the present melt shop which was made originally to accommodate the Blastola.

Going prices as obtained in the trade by THE IRON AGE, based on representative tonnages.

## PITTSBURGH

**Per gross ton delivered to consumer:**

| | |
|---|---|
| No. 1 hvy. melting | $42.50 to $43.00 |
| RR. hvy. melting | 43.50 to 44.00 |
| No. 2 hvy. melting | 42.50 to 43.00 |
| RR. scrap rails | 57.50 to 58.50 |
| Rails 2 ft and under | 62.00 to 62.50 |
| No. 1 comp'd bundles | 42.50 to 43.00 |
| Hand bdld. new shts. | 42.50 to 43.00 |
| Hvy. axle turn. | 45.50 to 46.50 |
| Hvy. steel forge turn. | 45.50 to 46.50 |
| Mach. shop turn. | 37.50 to 38.00 |
| Shoveling turn. | 39.50 to 40.00 |
| Mixed bor. and turn. | 37.50 to 38.00 |
| Cast iron borings | 39.50 to 40.00 |
| No. 1 mach. cast | 69.50 to 70.50 |
| Mixed yard cast | 63.50 to 64.50 |
| Hvy. breakable cast. | 60.00 to 61.00 |
| Malleable | 76.00 to 77.00 |
| RR. knuck. and cup. | 60.00 to 61.00 |
| RR. coil springs | 60.00 to 61.00 |
| RR. leaf springs | 60.00 to 61.00 |
| Rolled steel wheels | 60.00 to 61.00 |
| Low phos. | 50.00 to 50.50 |

## CHICAGO

**Per gross ton delivered to consumer:**

| | |
|---|---|
| No. 1 hvy. melting | $41.50 to $42.00 |
| No. 2 hvy. melting | 41.50 to 42.00 |
| No. 1 bundles | 41.50 to 42.00 |
| No. 2 dealers' bundles | 41.50 to 42.00 |
| Bundled mach. shop turn. | 39.50 to 40.00 |
| Galv. bundles | 39.50 to 40.00 |
| Mach. shop turn. | 36.50 to 37.00 |
| Short shov. turn. | 38.50 to 39.00 |
| Cast iron borings | 37.50 to 38.00 |
| Mix. borings and turn. | 36.50 to 37.00 |
| Low phos. hvy. forge | 51.00 to 52.00 |
| Low phos. plates | 49.00 to 50.00 |
| No. 1 RR. hvy. melt. | 44.25 to 48.50 |
| Rerolling rails | 66.00 to 68.00 |
| Miscellaneous rails | 61.00 to 62.00 |
| Angles & splice bars | 56.00 to 56.50 |
| Locomotive tires, cut | 58.00 to 59.00 |
| Cut bolster & side frames | 51.00 to 53.00 |
| Standard stl. car axles | 77.00 to 78.00 |
| No. 3 steel wheels | 54.00 to 55.00 |
| Couplers and knuckles | 55.00 to 56.00 |
| Rails, 2 ft and under | 60.00 to 63.00 |
| Malleable | 82.00 to 83.00 |
| No. 1 mach. cast. | 69.00 to 70.00 |
| No. 1 agricul. cast. | 63.00 to 65.00 |
| Heavy breakable cast. | 62.00 to 63.00 |
| RR. grate bars | 66.00 to 67.00 |
| Cast iron brake shoes | 58.00 to 60.00 |
| Cast iron car wheels | 62.00 to 63.00 |

## CINCINNATI

**Per gross ton, f.o.b. cars:**

| | |
|---|---|
| No. 1 hvy. melting | $40.00 to $41.00 |
| No. 2 hvy. melting | 40.00 to 41.00 |
| No. 1 bundles | 40.00 to 41.00 |
| No. 2 bundles | 40.00 to 41.00 |
| Mach. shop turn. | 35.00 to 36.00 |
| Shoveling turn. | 37.00 to 38.00 |
| Cast iron borings | 36.00 to 37.00 |
| Mixed bor. & turn. | 35.00 to 36.00 |
| Low phos., 18 in. under | 48.00 to 49.00 |
| No. 1 cupola cast. | 65.00 to 66.00 |
| Hvy breakable cast | 59.00 to 60.00 |
| Rails 18 in. and under | 61.00 to 63.00 |
| Rails random length | 56.00 to 57.00 |
| Drop broken | 69.00 to 70.00 |

## BOSTON

**Brokers' buying prices per gross ton, on cars:**

| | |
|---|---|
| No. 1 hvy. melting | $34.40 to $36.40 |
| No. 2 hvy. melting | 34.40 |
| Nos. 1 and 2 bundles | 34.40 |
| Bushelings | 34.40 |
| Shoveling turn. | 31.40 |
| Machine shop turn. | 29.40 |
| Mixed bor. and turn. | 29.40 |
| Cl'n cast chem. bor. | 38.00 to 39.50 |
| No. 1 machinery cast | 64.00 to 65.00 |
| No. 2 machinery cast | 59.00 to 60.00 |
| Heavy breakable cast. | 53.50 to 54.50 |
| Stove plate | 52.50 to 53.50 |

## DETROIT

**Per gross ton, brokers' buying prices f.o.b. cars:**

| | |
|---|---|
| No. 1 hvy. melting | $38.00 |
| No. 2 hvy. melting | 38.00 |
| No. 1 bundles | 38.00 |
| New busheling | 38.00 |
| Flashings | 38.00 |
| Mach. shop turn. | $32.50 to 33.00 |
| Machinery cast | 63.00 to 65.00 |
| Mixed yard cast | 57.00 to 58.00 |
| Shoveling turn. | 34.50 to 35.00 |
| Cast iron borings | 33.50 to 34.00 |
| Mixed bor. & turn. | 34.50 to 35.00 |
| Low phos. plate | 42.50 to 43.00 |
| Heavy breakable cast. | 53.00 to 57.00 |
| Stove plate | 57.00 to 58.00 |
| Automotive cast. | 64.00 to 66.00 |

## PHILADELPHIA

**Per gross ton delivered to consumer:**

| | |
|---|---|
| No. 1 hvy. melting | $44.50 to $45.50 |
| No. 2 hvy. melting | 41.00 to 41.50 |
| No. 1 bundles | 44.50 to 45.50 |
| No. 2 bundles | 41.00 to 41.50 |
| Mach. shop turn. | 37.00 to 38.00 |
| Shoveling turn. | 38.50 to 39.00 |
| Mixed bor. and turn. | 36.50 to 37.50 |
| Clean cast chemical bor. | 43.00 to 45.00 |
| No. 1 machinery cast | 65.00 to 66.00 |
| No. 1 mixed yard cast | 61.00 to 62.00 |
| Hvy. breakable cast | 62.00 to 63.00 |
| Clean auto cast. | 65.00 to 66.00 |
| Hvy. axle forge turn. | 46.00 to 47.00 |
| Low phos. plate | 51.00 to 52.00 |
| Low phos. punchings | 51.00 to 52.00 |
| Low phos. bundles | 48.00 to 49.00 |
| RR. steel wheels | 54.00 to 55.00 |
| RR. coil springs | 54.00 to 55.00 |
| RR. malleable | 78.00 to 80.00 |
| Cast iron carwheels | 68.00 to 70.00 |

## ST. LOUIS

**Per gross ton delivered to consumer:**

| | |
|---|---|
| No. 1 hvy. melting | $43.00 to $44.00 |
| No. 2 hvy. melting | 40.00 to 41.00 |
| Bundled sheets | 40.00 to 41.00 |
| Mach. shop turn. | 35.00 to 36.00 |
| Shoveling turnings | 37.00 to 38.00 |
| Locomotive tires, uncut | 47.00 to 48.00 |
| Mis. std. sec. rails | 54.00 to 56.00 |
| Steel angle bars | 54.00 to 55.00 |
| Rails 3 ft and under | 58.00 to 60.00 |
| RR. steel springs | 49.00 to 50.00 |
| Steel car axles | 56.00 to 57.00 |
| Grate bars | 59.00 to 60.00 |
| Brake shoes | 59.00 to 60.00 |
| Malleable | 73.00 to 75.00 |
| Cast iron car wheels | 60.00 to 61.00 |
| No. 1 machinery cast | 66.00 to 68.00 |
| Hvy. breakable cast. | 59.00 to 60.00 |

## BIRMINGHAM

**Per gross ton delivered to consumer:**

| | |
|---|---|
| No. 1 hvy. melting | $40.00 |
| No. 2 hvy. melting | 40.00 |
| No. 2 bundles | 40.00 |
| No. 1 bunsheling | 40.00 |
| Long turnings | $32.00 to 33.00 |
| Shoveling turnings | 35.00 to 36.00 |
| Cast iron borings | 29.50 |
| Bar crops and plate | 44.00 to 45.00 |
| Structural and plate | 44.00 to 45.00 |
| No. 1 cupola cast. | 67.00 to 68.00 |
| Stove plate | 64.00 to 65.00 |
| No. 1 RR. hvy. melt. | 41.00 |
| Steel axles | 51.00 to 52.00 |
| Scrap rails | 44.00 to 45.00 |
| Rerolling rails | 57.00 to 60.00 |
| Angles & splice bars | 51.00 to 53.00 |
| Rails 3 ft & under | 52.00 to 55.00 |
| Cast iron carwheels | 57.00 to 58.00 |

## YOUNGSTOWN

**Per gross ton delivered to consumer:**

| | |
|---|---|
| No. 1 hvy. melting | $42.50 to $43.00 |
| No. 2 hvy. melting | 42.50 to 43.00 |
| Mach. shop turn. | 37.50 to 38.00 |
| Short shov. turn. | 39.00 to 40.00 |
| Cast iron borings | 38.00 to 39.00 |
| Low phos. | 47.50 to 48.00 |

## NEW YORK

**Brokers' buying prices per gross ton, on cars:**

| | |
|---|---|
| No. 1 hvy. melting | $38.50 to $39.00 |
| No. 2 hvy. melting | 37.00 |
| No. 2 bundles | 37.00 |
| Mach. shop turn. | 31.50 to 32.00 |
| Mixed bor. & turn. | 31.50 to 32.00 |
| Shoveling turnings | 33.50 to 34.00 |
| Machinery cast | 59.00 to 60.00 |
| Mixed yard cast | 57.00 to 58.00 |
| Heavy breakable cast. | 56.00 to 57.00 |
| Charging box cast. | 56.00 to 57.00 |
| Unstrp. motor blks. | 53.50 to 54.50 |
| Cl'n cast chem. bor. | 38.50 to 39.50 |

## BUFFALO

**Per gross ton delivered to consumer:**

| | |
|---|---|
| No. 1 hvy. melting | $47.00 to $49.00 |
| No. 2 hvy. melting | 41.75 to 42.25 |
| No. 1 bundles | 41.75 to 42.25 |
| No. 2 bundles | 41.75 to 42.25 |
| No. 1 busheling | 41.75 to 42.25 |
| Mach. shop turn. | 36.75 to 37.25 |
| Shoveling turn. | 37.25 to 38.00 |
| Cast iron borings | 37.75 to 38.25 |
| Mixed bor. and turn. | 36.75 to 37.25 |
| Clean auto. cast. | 65.00 to 66.00 |
| Mixed cupola cast. | 65.00 to 66.00 |
| Stove plate | 64.00 to 65.00 |
| RR. malleable | 70.00 to 75.00 |
| Small indus. malleable | 47.00 to 49.00 |
| Low phos. plate | 48.00 to 50.00 |
| Scrap rails | 58.00 to 60.00 |
| Rails 3 ft & under | 63.00 to 64.00 |
| RR steel wheels | 58.00 to 60.00 |
| RR. coil & leaf spgs. | 58.00 to 60.00 |
| RR. knuckles & coup. | 58.00 to 60.00 |

## CLEVELAND

**Per gross ton delivered to consumer:**

| | |
|---|---|
| No. 1 hvy. melting | $42.00 to $42.50 |
| No. 2 hvy. melting | 42.00 to 42.50 |
| No. 1 bundles | 42.00 to 42.50 |
| No. 1 busheling | 42.00 to 42.50 |
| Drop forge flashings | 42.00 to 42.50 |
| Mach. shop turn. | 37.00 to 37.50 |
| Shoveling turn. | 38.50 to 39.50 |
| Steel axle turn. | 42.00 to 42.50 |
| Cast iron borings | 37.50 to 38.50 |
| Mixed bor. & turn. | 36.50 to 37.50 |
| Low phos. 2 ft and under | 47.00 to 47.50 |
| No. 1 machinery cast | 72.00 to 74.50 |
| Malleable | 79.00 to 81.00 |
| RR. cast. | 76.00 to 77.00 |
| Railroad grate bars | 60.00 to 62.00 |
| Stove plate | 61.00 to 63.00 |
| RR. hvy. melting | 43.00 to 43.50 |
| Rails 3 ft and under | 63.50 to 64.50 |
| Rails 18 in. and under | 65.00 to 66.00 |

## SAN FRANCISCO

**Per gross ton, f.o.b. shipping point:**

| | |
|---|---|
| No. 1 hvy. melting | $27.50 |
| No. 2 hvy. melting | 27.50 |
| No. 2 bales | 27.50 |
| No. 3 bales | 24.50 |
| Mach. shop turn. | 18.00 |
| Elec. fur. 1 ft under | $40.00 to 42.00 |
| No. 1 cupola cast | 58.00 to 60.00 |
| RR. hvy. melting | 28.50 |
| Rails | 29.00 |

## LOS ANGELES

**Per gross ton, f.o.b. shipping point:**

| | |
|---|---|
| No. 1 hvy. melting | $27.50 |
| No. 2 hvy. melting | 27.50 |
| No. 1 bales | 27.50 |
| No. 2 bales | 27.50 |
| No. 3 bales | 24.50 |
| Mach. shop turn. | 20.00 |
| Elec. fur. 1 ft under | $40.00 to 42.00 |
| No. 1 cupola cast | 58.00 to 60.00 |
| RR. hvy. melting | 28.50 |

## SEATTLE

**Per gross ton delivered to consumer:**

| | |
|---|---|
| No. 1 & No. 2 hvy. melt. | $27.50 to $30.00 |
| Elec. fur. 1 ft and under | 36.50 to 40.00 |
| No. 1 cupola cast. | 50.00 to 56.00 |
| RR. hvy. melting | 28.50 |

## HAMILTON, ONT.

**Per gross ton delivered to consumer: Cast grades f.o.b. shipping point:**

| | |
|---|---|
| Heavy melting | $22.00* |
| No. 1 bundles | 22.00* |
| No. 2 bundles | 21.50* |
| Mechanical bundles | 20.00* |
| Mixed steel scrap | 19.00* |
| Mixed borings and turnings | 17.00* |
| Rails, remelting | 23.00* |
| Rails, rerolling | 26.00* |
| Bushelings | 17.00* |
| Bushelings, new fact. prop'd | 21.00* |
| Bushelings, new fact. unprop'd | 16.00* |
| Short steel turnings | 17.00* |
| No. 1 cast | $42.00 to 46.00 |
| No. 2 cast | 35.00 to 37.00 |

*Ceiling Price.

# Comparison of Prices . .

Price advances over previous week are printed in Heavy Type; declines appear in *Italics*.

*Steel prices on this page are the average of various f.o.b. quotations of major producing areas: Pittsburgh, Chicago, Gary, Cleveland, Youngstown.*

| Flat-Rolled Steel: (cents per pound) | Oct. 12, 1948 | Oct. 5, 1948 | Sept. 14, 1948 | Oct. 14, 1947 |
|---|---|---|---|---|
| Hot-rolled sheets | 3.26 | 3.26 | 3.26 | 2.80 |
| Cold-rolled sheets | 4.00 | 4.00 | 4.00 | 3.55 |
| Galvanized sheets (10 ga) | 4.40 | 4.40 | 4.40 | 3.95 |
| Hot-rolled strip | 3.265 | 3.265 | 3.265 | 2.80 |
| Cold-rolled strip | 4.063 | 4.063 | 4.063 | 3.55 |
| Plates | 3.42 | 3.42 | 3.42 | 2.95 |
| Plates wrought iron | 7.85 | 7.85 | 7.85 | 6.85 |
| Stains C-R strip (No. 302) | 33.00 | 33.00 | 33.25 | 30.50 |
| **Tin and Terneplate:** (dollars per base box) | | | | |
| Tinplate (1.50 lb) cokes | $6.80 | $6.80 | $6.80 | $5.75 |
| Tinplate, electro (0.50 lb) | 6.00 | 6.00 | 6.00 | 5.05 |
| Special coated mfg. ternes | 5.90 | 5.90 | 5.90 | 4.90 |
| **Bars and Shapes:** (cents per pound) | | | | |
| Merchant bars | 3.37 | 3.37 | 3.37 | 2.90 |
| Cold-finished bars | 3.995 | 3.995 | 3.995 | 3.55 |
| Alloy bars | 3.75 | 3.75 | 3.75 | 3.30 |
| Structural shapes | 3.25 | 3.25 | 3.25 | 2.80 |
| Stainless bars (No. 302) | 28.50 | 28.50 | 28.25 | 26.00 |
| Wrought iron bars | 9.50 | 9.50 | 9.50 | 7.15 |
| **Wire:** (cents per pound) | | | | |
| Bright wire | 4.256 | 4.256 | 4.256 | 3.55 |
| **Rails:** (dollars per 100 lb) | | | | |
| Heavy rails | $3.20 | $3.20 | $3.20 | $2.75 |
| Light rails | 3.55 | 3.55 | 3.55 | 3.10 |
| **Semifinished Steel:** (dollars per net ton) | | | | |
| Rerolling billets | $52.00 | $52.00 | $52.00 | $45.00† |
| Slabs, rerolling | 52.00 | 52.00 | 52.00 | 45.00† |
| Forging billets | 61.00 | 61.00 | 61.00 | 55.00† |
| Alloy blooms, billets, slabs | 63.00 | 63.00 | 63.00 | 66.00† |
| **Wire rod and Skelp:** (cents per pound) | | | | |
| Wire rods | 3.619 | 3.619 | 3.619 | 2.80 |
| Skelp | 3.25 | 3.25 | 3.25 | 2.60 |

† Gross ton

| Pig Iron (per gross ton) | Oct. 12, 1948 | Oct. 5, 1948 | Sept. 14, 1948 | Oct. 14, 1947 |
|---|---|---|---|---|
| No. 2, foundry, Phila. | $51.56 | $51.56 | $51.56 | $41.36 |
| No. 2, Valley furnace | **46.50** | 45.00 | 43.50 | 36.50 |
| No. 2, Southern Cin'ti | 49.47 | 49.47 | 49.47 | 40.24 |
| No. 2, Birmingham | 43.38 | 43.38 | 43.38 | 34.88 |
| No. 2, foundry, Chicago† | 46.00 | 46.00 | 43.00 | 37.00 |
| Basic del'd Philadelphia | 50.76 | 50.76 | 50.76 | 40.86 |
| Basic, Valley furnace | **46.00** | 44.50 | 43.00 | 36.00 |
| Malleable, Chicago† | 46.50 | 46.50 | 43.50 | 36.50 |
| Malleable, Valley | **46.50** | 45.00 | 43.50 | 36.50 |
| Charcoal, Chicago | 73.78* | 73.78* | 69.55 | 49.49 |
| Ferromanganese‡ | 161.71 | 161.71 | 145.00 | 145.00 |

† The switching charge for delivery to foundries in the Chicago district is $1 per ton.
‡ Average of U. S. prices quoted on Ferroalloy page.
• Revised.

| Scrap (per gross ton) | Oct. 12, 1948 | Oct. 5, 1948 | Sept. 14, 1948 | Oct. 14, 1947 |
|---|---|---|---|---|
| Heavy melt'g steel, P'gh. | $42.75 | $42.75 | $42.75 | $40.25 |
| Heavy melt'g steel, Phila. | 45.00 | 45.00 | 45.00 | 39.50 |
| **Heavy melt'g steel, Ch'go** | **41.75** | **41.75** | **41.75** | 38.75 |
| **No. 1, hy, comp. sh't, Det.** | **38.00** | **38.00** | **38.00** | 34.50 |
| Low phos. Young'n | 47.75 | 47.75 | 47.75 | 46.25 |
| No. 1, cast, Pittsburgh | 70.00 | 70.00 | 65.00 | 44.25 |
| No. 1, cast, Philadelphia | 65.50 | 65.50 | 65.50 | 49.50 |
| No. 1, cast, Chicago | 69.50 | 69.50 | 71.00 | 50.00 |
| **Coke, Connellsville:** (per net ton at oven) | | | | |
| Furnace coke, prompt | $15.00 | $15.00 | $15.00 | $12.50 |
| Foundry coke, prompt | 17.00 | 17.00 | 17.00 | 14.00 |
| **Nonferrous Metals:** (cents per pound to large buyers) | | | | |
| Copper, electro, Conn. | 23.50 | 23.50 | 23.50 | 21.50 |
| Copper, Lake Conn. | **23.625** | **23.625** | **23.625** | **21.625** |
| Tin, Grade A, New York | **$1.03** | **$1.03** | **$1.03** | 80.00 |
| Zinc, East St. Louis | **15.00** | **15.00** | **15.00** | 10.50 |
| Lead, St. Louis | **19.30** | **19.30** | **19.30** | 14.80 |
| Aluminum, virgin | **17.00** | 16.00 | 16.00 | 15.00 |
| Nickel, electrolytic | 42.90 | 42.90 | 42.90 | 37.67 |
| Magnesium, ingot | 20.50 | 20.50 | 20.50 | 20.50 |
| Antimony, Laredo, Tex. | **38.50** | 35.00 | 35.00 | 33.00 |

# Composite Prices . .

Starting with the issue of Apr. 22, 1943, the weighted finished steel index was revised for the years 1941, 1942, and 1943. See explanation of the change on p. 90 of the Apr. 22, 1943, issue. Index revised to a quarterly basis as of Nov. 16, 1944; for details see p. 98 of that issue. The finished steel composite price for the current quarter is an estimate based on finished steel shipments for the previous quarter. This figure will be revised when shipments for this quarter are compiled.

| | FINISHED STEEL (Base Price) | PIG IRON | SCRAP STEEL |
|---|---|---|---|
| Oct. 12, 1948 | 3.75255¢ per lb. | $46.82 per gross ton | $43.16 per gross ton |
| One week ago | 3.75255¢ per lb. | $46.07 per gross ton | $43.16 per gross ton |
| One month ago | 3.75255¢ per lb. | $45.07 per gross ton | $43.16 per gross ton |
| One year ago | 3.19541¢ per lb. | $36.96 per gross ton | $39.50 per gross ton |

| | HIGH | LOW |
|---|---|---|
| 1948 | 3.75325¢ July 27 | 3.22566¢ Jan. 1 |
| 1947 | 3.19541¢ Oct. 7 | 2.87118¢ Jan. 7 |
| 1946 | 2.83599¢ Dec. 31 | 2.54490¢ Jan 1 |
| 1945 | 2.44104¢ Oct. 2 | 2.38444¢ Jan. 2 |
| 1944 | 2.30837¢ Sept. 5 | 2.21189¢ Oct. 5 |
| 1943 | 2.29176¢ | 2.29176¢ |
| 1942 | 2.28249¢ | 2.28249¢ |
| 1941 | 2.43078¢ | 2.43078¢ |
| 1940 | 2.30467¢ Jan. 2 | 2.24107¢ Apr. 16 |
| 1939 | 2.35367¢ Jan. 3 | 2.26689¢ May 16 |
| 1938 | 2.58414¢ Jan. 4 | 2.27207¢ Oct. 18 |
| 1937 | 2.58414¢ Mar. 9 | 2.32263¢ Jan. 4 |
| 1936 | 2.32263¢ Dec. 28 | 2.05200¢ Mar. 10 |
| 1935 | 2.07642¢ Oct. 1 | 2.06492¢ Jan. 8 |
| 1934 | 2.15367¢ Apr. 24 | 1.95757¢ Jan. 2 |
| 1933 | 1.95578¢ Oct. 3 | 1.75836¢ May 2 |
| 1932 | 1.89196¢ July 5 | 1.83901¢ Mar. 1 |
| 1931 | 1.99626¢ Jan. 13 | 1.86586¢ Dec. 29 |
| 1930 | 2.25488¢ Jan. 7 | 1.97319¢ Dec. 9 |
| 1929 | 2.31773¢ May 28 | 2.26498¢ Oct. 29 |

Weighted index based on steel bars, shapes, plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing major portion of finished steel shipments. Index recapitulated in Aug. 28, 1941, issue.

| | HIGH | LOW |
|---|---|---|
| 1948 | $46.82 Oct. 12 | $39.58 Jan. 6 |
| 1947 | 37.98 Dec. 30 | 30.14 Jan. 7 |
| 1946 | 30.14 Dec. 10 | 25.37 Jan. 1 |
| 1945 | 25.37 Oct. 23 | 23.61 Jan. 2 |
| 1944 | $23.61 | $23.61 |
| 1943 | 23.61 | 23.61 |
| 1942 | 23.61 | 23.61 |
| 1941 | $23.61 Mar. 20 | $23.45 Jan. 2 |
| 1940 | 23.45 Dec. 23 | 22.61 Jan. 2 |
| 1939 | 22.61 Sept. 19 | 20.61 Sept. 12 |
| 1938 | 23.25 June 21 | 1961 July 6 |
| 1937 | 23.25 Mar. 9 | 20.25 Feb. 16 |
| 1936 | 19.74 Nov. 24 | 18.73 Aug. 11 |
| 1935 | 18.84 Nov. 5 | 17.83 May 14 |
| 1934 | 17.90 May 1 | 16.90 Jan. 27 |
| 1933 | 16.90 Dec. 5 | 13.56 Jan. 3 |
| 1932 | 14.81 Jan. 5 | 13.56 Dec. 6 |
| 1931 | 15.90 Jan. 6 | 14.79 Dec. 15 |
| 1930 | 18.21 Jan. 7 | 15.90 Dec. 16 |
| 1929 | 18.71 May 14 | 18.21 Dec. 17 |

Based on averages for basic iron at valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

| | HIGH | LOW |
|---|---|---|
| 1948 | $43.16 July 27 | $39.75 Mar. 9 |
| 1947 | 42.58 Oct. 28 | 29.50 May 20 |
| 1946 | 31.17 Dec. 24 | 19.17 Jan. 1 |
| 1945 | 19.17 Jan. 2 | 18.92 May 22 |
| 1944 | 19.17 Jan. 11 | 15.76 Oct. 24 |
| 1943 | $19.17 | $19.17 |
| 1942 | 19.17 | 19.17 |
| 1941 | $22.00 Jan. 7 | $19.17 Apr. 10 |
| 1940 | 21.83 Dec. 30 | 16.04 Apr. 9 |
| 1939 | 22.50 Oct. 3 | 14.08 May 16 |
| 1938 | 15.00 Nov. 22 | 11.00 June 7 |
| 1937 | 21.92 Mar. 30 | 12.67 June 9 |
| 1936 | 17.75 Dec. 21 | 12.67 June 8 |
| 1935 | 13.42 Dec. 10 | 10.33 Apr. 29 |
| 1934 | 13.00 Mar. 13 | 9.50 Sept. 25 |
| 1933 | 12.25 Aug. 8 | 6.75 Jan. 3 |
| 1932 | 8.50 Jan. 12 | 6.43 July 5 |
| 1931 | 11.33 Jan. 6 | 8.50 Dec. 29 |
| 1930 | 15.00 Feb. 18 | 11.25 Dec. 9 |
| 1929 | 17.58 Jan. 29 | 14.08 Dec. 8 |

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

# Iron and Steel Prices . . .

Steel prices shown here are f.o.b. producing points in cents per pound unless otherwise indicated. Extras apply. (1) Commercial quality sheet grade; prices, 0.25¢ above base. (2) Commercial quality grade. (3) Widths up to 12-in. inclusive. (4) 0.25 carbon and less. (5) Cokes, 1.25 lb, deduct 20¢ per base box. (6) 18 gage and heavier. (7) For straight length material only from producers to fabricators. (8) Also shafting. For quantities of 40,000 lb and over. (9) Carload lot in manufacturing trade. (10) Hollowware enameling, gages 29 to 31 only. (11) Produced to dimensional tolerances in AISI Manual Sec. 6. (12) Slab prices subject to negotiation in most cases. (13) San Francisco only. (14) Los Angeles only. (15) San Francisco and Los Angeles only. (16) Seattle only. (17) Seattle and Los Angeles only.

| PRODUCTS | Base prices at producing points apply to the sizes and grades produced in these areas | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pittsburgh | Chicago | Gary | Cleveland | Birmingham | Buffalo | Youngstown | Sparrows Point | Granite City | Middletown, Ohio | | Detroit | Johnstown | Seattle, S. Fr'isco, LosAngeles | Fontana |
| INGOTS Carbon forging | $50.00 | | | | | | | | | | | | | | |
| Alloy | $51.00 | | | | | | (per net ton) | | | | | | | | |
| BILLETS, BLOOMS, SLABS Carbon, rerolling[12] | $52.00 | | | | $52.00 | $52.00 | (per net ton) | | | | | | $52.00 | | |
| Carbon forging billets | $61.00 | $61.00 | $61.00 | $61.00 | $61.00 | $61.00 | (per net ton) | | | | | | $61.00 | | |
| Alloy | $63.00 | $63.00 | | | | $63.00 | (Bethlehem, Canton, Massillon = $63.00) (per net ton) | | | | | | | | |
| PIPE SKELP | 3.25 | | | | | | 3.25 | | | | Warren =3.25 | | | | |
| WIRE RODS | 3.40 to 4.15 | 3.40 to 3.90 | | 3.40 | 3.40 | | 3.65 | 3.40 | | | Worcester 3.70 | | 3.40 | 4.05[13] 4.10[14] | |
| SHEETS Hot-rolled[6] | 3.25 to 3.30 | 3.25 | 3.25 | 3.25–3.30 | 3.25 | 3.25 | 3.25 | 3.25 | | Warren, Ashland =3.25 | | 3.45 | | 3.95[15] | 5.65 |
| Cold-rolled[1] | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.20 | 4.00 | Warren 4.00 | 4.20 | | | |
| Galvanized (10 gage) | 4.40 | 4.40 | 4.40 | | 4.40 | | | 4.40 | Canton =4.40 | 4.40 | Ashland =4.40 | | | 5.15[15] | |
| Enameling (12 gage) | 4.40 | 4.40 | 4.40 | 4.40 | | | 4.40 | | 4.60 | 4.40 | | 4.70 | | | |
| Long ternes[2] (10 gage) | 4.80 | | 4.80 | | | | | | | 4.80 | | | | | |
| STRIP Hot-rolled[3] | 3.25 to 3.30 | 3.25 to 3.30 | 3.25 | 3.25 to 3.30 | 3.25 | 3.25 | 3.25 | 3.25 | | 3.25 | Warren =3.25 | 3.45 | | 4.00 to 4.25 | 5.90 |
| Cold-rolled[4] | 4.00 | 4.25 | | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | | New Haven 4.00 Warren =4.00 to 4.25 | | 4.20 to 4.50 | | | 7.10 |
| TINPLATE Cokes, 1.50 lb.[5] base box | $6.80 | $6.80 | $6.80 | | $6.90 | [16] | | $6.90 | $7.00 | Warren, Ohio =$6.80 | | | | Pittsburg, Cal.=$7.55 | |
| Electrolytic 0.25, 0.50, 0.75 lb. box | Deduct $1.00. 80¢ and 60¢ respectively from 1.50 lb. coke base box price | | | | | | | | | | | | | | |
| TERNES MFG., special coated | Deduct 90¢ from 1.50 lb. coke base box price | | | | | | | | | | | | | | |
| BLACKPLATE CANMAKING 55-70 lb, 75-95 lb, 100-128 lb | Deduct $1.60, $1.70 and $1.60 respectively from 1.50 lb. coke base box price | | | | | | | | | | | | | | |
| BLACKPLATE, h.e., 29 ga.[10] | 4.75 | 4.75 | 4.75 | | | | | 4.85 | | | | | | | |
| BARS Carbon Steel | 3.35 to 3.55 | 3.35 | 3.35 | 3.35 | 3.35 | 3.35 | 3.35 | 3.35 | | 3.35 | Canton =3.35 | | 3.35 | 4.05 to 4.10 | 5.30 |
| Reinforcing (billet)[7] | 3.35 | 3.35 | 3.35 | 3.35 | 3.35 | 3.35 | 3.35 | 3.35 | | | Canton =3.35 | | 3.35 | 4.05 to 4.10 | 5.30 |
| Cold-finished[8] | 3.95 to 4.00 | 4.00 | 4.00 | 4.00 | | | 4.00 | | | | | 4.30 | | | |
| Alloy, hot-rolled | 3.75 | 3.75 | 3.75 | | | 3.75 | 3.75 | Bethlehem, Canton, Massillon=3.75 | | | | | 3.75 | 4.80[14] | 5.50 |
| Alloy cold-drawn | | | | | | | | Massillon=4.65 | | | | | | | |
| PLATE Carbon steel[11] | 3.40 to 3.60 | 3.40 | 3.40 | 3.40 | 3.40 Consh | 3.45 ohocken | 3.40 =3.95 | Coatesville=3.75, Claymont=3.95 Geneva, Utah=3.40, Harrisburg=6.50 | | | | 3.65 | 3.45 | 4.30[16] | 5.80 |
| Floor plates | 4.55 | 4.55 | | 4.55 | | | | Consh | ohocken | =4.55 | | | | | |
| Alloy | 4.40 | 4.40 | | | | | | | Coatesville=5.10 | | | | | | |
| SHAPES, Structural | 3.25 | 3.25 | 3.25 | | 3.25 | 3.30 | Bethlehem=3.30, Geneva, Utah=3.25 | | | | | | 3.30 | 3.85 to 4.30 | 5.75 |
| MANUFACTURERS' WIRE[9] Bright | 4.15 to 4.50 | 4.15 to 4.65 | | 4.15 | 4.15 | | 4.15 | 4.25 | Duluth=4.15, Worcester=4.45 | | | | 4.15 | 5.10[13] | |
| Spring (high carbon) | 5.20 | 5.20 | | 5.20 | | | | 5.30 | Worcester=5.50 New Haven, Trenton=5.50 | | | | 5.20 | Duluth= 5.20-6.15 | |
| PILING, Steel sheet | 4.05 | 4.05 | | | | 4.05 | | | | | | | | | |

## STAINLESS STEELS

Base prices, in cents per pound, f.o.b. producing point

| Product | Chromium Nickel | | | | | | Straight Chromium | | |
|---|---|---|---|---|---|---|---|---|---|
| | 301 | 302 | 303 | 304 | 316 | 347 | 410 | 416 | 430 |
| Ingots, rerolling | 12.75 | 13.50 | 15.00 | 14.50 | 22.75 | 20.00 | 11.25 | 13.75 | 11.50 |
| Slabs, billets, rerolling | 17.00 | 18.25 | 20.25 | 19.25 | 30.25 | 26.75 | 15.00 | 18.50 | 15.25 |
| Forging discs, die blocks, rings | 30.50 | 30.50 | 33.00 | 32.00 | 49.00 | 41.00 | 24.50 | 25.00 | 25.00 |
| Billets, forging | 24.25-26.50 | 24.25-26.50 | 26.25-28.75 | 25.50-27.75 | 39.00-42.75 | 32.75-35.75 | 19.50-21.50 | 20.00-21.75 | 20.00-21.75 |
| Bars, wire, structurals | 28.50 | 28.50 | 31.00 | 30.00 | 46.00 | 38.50 | 23.00 | 23.50 | 23.50 |
| Plates | 32.00 | 32.00 | 34.00 | 34.00 | 50.50 | 44.00 | 26.00 | 26.50 | 26.50 |
| Sheets | 37.50-40.75 | 37.50-40.75 | 39.50-43.00 | 39.50-43.00 | 53.00-57.25 | 50.00-54.00 | 33.00 ..... | 33.50 ..... | 35.50 ..... |
| Strip, hot-rolled | 24.25 | 25.75 | 30.00 | 27.75 | 46.00 | 38.75 | 21.25 | 28.00 | 21.75 |
| Strip, cold-rolled | 30.50-30.75 | 33.00-33.50 | 36.50-39.50 | 35.00-35.75 | 55.00-57.25 | 48.50-50.00 | 27.00 ..... | 33.50 ..... | 27.50 ..... |

## ELECTRODES

Cents per lb, f.o.b. plant, threaded electrodes with nipples, unboxed

| Diameter in in. | Length in in. | |
|---|---|---|
| **Graphite** | | |
| 17, 18, 20 | 60, 72 | 16.00¢ |
| 8 to 16 | 48, 60, 72 | 16.50¢ |
| 7 | 48, 60 | 17.75¢ |
| 6 | 48, 60 | 19.00¢ |
| 4, 5 | 40 | 19.50¢ |
| 3 | 40 | 20.50¢ |
| 2½ | 24, 30 | 21.00¢ |
| 2 | 24, 30 | 23.00¢ |
| **Carbon** | | |
| 40 | 100, 110 | 7.50¢ |
| 35 | 65, 110 | 7.50¢ |
| 30 | 65, 84, 110 | 7.50¢ |
| 24 | 72 to 104 | 7.50¢ |
| 17 to 20 | 84, 90 | 7.50¢ |
| 14 | 60, 72 | 8.00¢ |
| 10, 12 | 60 | 8.25¢ |
| 8 | 60 | 8.50¢ |

## TOOL STEEL

*F.o.b. mill*

| W | Cr | V | Mo | Co | Base per lb |
|---|---|---|---|---|---|
| 18 | 4 | 1 | — | — | 90.5¢ |
| 18 | 4 | 1 | — | 5 | $1.42 |
| 18 | 4 | 2 | — | — | $1.025 |
| 1.5 | 4 | 1.5 | 8 | — | 65¢ |
| 6 | 4 | 2 | 6 | — | 69.5¢ |

High-carbon-chromium ..... 52¢
Oil harden manganese ..... 29¢
Special carbon ..... 26.5¢
Extra carbon ..... 22¢
Regular carbon ..... 19¢

Warehouse prices on and east of Mississippi are 2½¢ per lb higher. West of Mississippi, 4½¢ higher.

## ELECTRICAL SHEETS

*Base, HR cut lengths, f.o.b. mill*

| | Cents per lb |
|---|---|
| Armature | 5.45 |
| Electrical | 5.95 |
| Motor | 6.70 |
| Dynamo | 7.50 |
| Transformer 72 | 8.05 |
| Transformer 65 | 8.60 |
| Transformer 58 | 9.30 |
| Transformer 52 | 10.10 |

## RAILS, TRACK SUPPLIES

*F.o.b. mill*

Standard rails, 100 lb and heavier, No. 1 O.H., per 100 lb ..... $3.20
Joint bars, 100 lb ..... 4.25
Light rails (from billets) per 100 lb ..... 3.55

| | Base per lb |
|---|---|
| Cut spikes | 5.35¢ |
| Screw spikes | 8.00¢ |
| Tie plates | 4.05¢ |
| Tie plates, Pittsburgh, Calif.* | 4.20¢ |
| Track bolts | 7.50¢ |
| Track bolts, heat treated, to railroads | 8.50¢ |

*Seattle, add 30¢.

## C-R SPRING STEEL

*Base per pound f.o.b. mill*

| | |
|---|---|
| 0.26 to 0.40 carbon | 4.00¢ |
| 0.41 to 0.60 carbon | 5.50¢ |
| 0.61 to 0.80 carbon | 6.10¢ |
| 0.81 to 1.05 carbon | 8.05¢ |
| 1.06 to 1.35 carbon | 10.35¢ |

Worcester, add 0.30¢.

## CLAD STEEL

*Base prices, cents per pound*

| | Plate | Sheet |
|---|---|---|
| Stainless clad | | |
| No. 304, 20 pct, f.o.b. | | |
| Coatesville, Pa. | *27.00 | |
| Washington, Pa. | *26.50 | *22.50 |
| Claymont, Del. | *26.50 | |
| Conshohocken, Pa. | | *22.50 |
| Nickel-clad | | |
| 10 pct f.o.b. Coatesville, Pa. | 27.50 | |
| Inconel-clad | | |
| 10 pct, f.o.b. Coatesville. | 36.00 | |
| Monel-clad | | |
| 10 pct, f.o.b. Coatesville. | 29.00 | |
| Alumnized steel sheets | | |
| Hot dip, 20 gage, f.o.b. Butler, Pa. | .... | 9.25 |

*Includes annealing and pickling, or sandblasting.

## MERCHANT WIRE PRODUCTS

*To the dealer, f.o.b. mill*

| | Base Column | Pittsburgh, Calif. |
|---|---|---|
| Standard & coated nails* | 103 | 123 |
| Galvanized nails* | 103 | 123 |
| Woven wire fence† | 109 | 132 |
| Fence posts, carloads†† | 114 | ... |
| Single loop bale ties | 106 | 130 |
| Galvanized barbed wire** | 123 | 143 |
| Twisted barbless wire | 123 | ... |

* Pgh., Chi., Duluth; Worcester, 6 columns higher. † 15½ gage and heavier. ** On 80 rod spools, in carloads. †† Duluth only.

| | Base per 100 lb | Pittsburg, Calif. |
|---|---|---|
| Annealed fence wire‡ | $4.80 | $5.75 |
| Annealed, galv. fencing‡ | 5.25 | 6.20 |
| Cut nails, carloads‡‡ | 6.75 | .... |

‡ Add 30¢ at Worcester; 10¢ at Sparrows Pt.
‡‡ Less 20¢ to jobbers.

## HIGH STRENGTH, LOW ALLOY STEELS

Mill base prices, cents per pound

| Steel | Aldecor | Corten | Double Strength No. 1 | Dyn-alloy | HI Steel | Mayari R | Otis-coloy | Yoloy | NAX High Tensile |
|---|---|---|---|---|---|---|---|---|---|
| Producer | Republic | Carnegie-Illinois, Republic | Republic | Alan Wood | Inland | Bethlehem | Jones & Laughlin | Youngstown Sheet & Tube | Great Lakes Steel |
| Plates | 5.20 | 5.20 | 5.20 | 5.30 | 5.20 | 5.30 | 5.20 | 5.20 | 5.65 |
| Sheets | | | | | | | | | |
| Hot-rolled | 4.95 | 4.95 | 4.95 | 5.25 | 4.95 | 4.95 | 4.95 | 4.95 | 5.25 |
| Cold-rolled | 6.05 | 6.05 | 6.05 | .... | 6.05 | 6.05 | 6.05 | 6.05 | 6.35 |
| Galvanized | .... | 6.75 | .... | .... | .... | 6.75 | .... | .... | .... |
| Strip | | | | | | | | | |
| Hot-rolled | 4.95 | 4.95 | 4.95 | .... | 4.95 | 4.95 | 4.95 | 4.95 | 5.25 |
| Cold-rolled | .... | .... | 6.05 | .... | .... | 6.05 | 6.05 | .... | 6.35 |
| Shapes | .... | 4.95 | .... | .... | 4.95 | 5.05 | 4.95 | .... | .... |
| Beams | .... | 4.95 | .... | .... | .... | .... | .... | .... | .... |
| Bars | | | | | | | | | |
| Hot-rolled | 5.10 | 5.10 | 5.10 | .... | 5.10 | 5.10 | 5.10 | .... | 5.40 |
| Bar shapes | .... | 5.10 | .... | .... | 5.10 | 5.10 | 5.10 | .... | .... |

## PIPE AND TUBING

*Base discounts, f.o.b. mills, steel buttweld and seamless. Base price, $200.00 per net ton.*

### *Standard, threaded and coupled*

| Steel, buttweld* | Black | Galv. |
|---|---|---|
| ⅛-in. | 46 | 26½ |
| ¼-in. | 48½ | 29½ |
| ⅜-in. | 49 | 30 |
| ½-in. | 49½ | 30½ |
| ¾-in. | 50 | 31 |
| 1 and 1¼-in. | 50½ | 31½ |
| Wrought Iron, buttweld | | |
| ⅛-in. | +20½ | +50 |
| ¼-in. | +10½ | +39 |
| ⅜-in. | + 4½ | +30 |
| ½-in. | — 1½ | +26½ |
| ¾-in. | — 2 | +26 |
| Steel, lapweld | | |
| 2-in. | 39½ | 20 |
| 2½ and 3-in. | 43½ | 24 |
| 3½ to 6-in. | 45½ | 26 |
| Steel, seamless | | |
| 2-in. | 38½ | 19 |
| 2½ and 3-in. | 41½ | 22 |
| 3½ to 6-in. | 43½ | 24 |
| Wrought Iron, lapweld | | |
| 2-in. | + 7½ | +34 |
| 2½ to 3½-in. | + 5 | +29½ |
| 4-in. | list | +23½ |
| 4½ to 8-in. | + 2 | +25 |

### *Extra Strong, plain ends*

| Steel, buttweld | | |
|---|---|---|
| ⅛-in. | 41 | 22 |
| ¼-in. | 45 | 26 |
| ⅜-in. | 47 | 29 |
| ½-in. | 47½ | 29½ |
| ¾-in. | 48 | 30 |
| 1-in. | 48½ | 30½ |
| 1¼ and 1½-in. | 49 | 31 |
| Wrought Iron, buttweld | | |
| ⅛-in. | +16 | +44 |
| ¼-in. | + 9½ | +37 |
| ⅜-in. | — 1½ | +26 |
| Steel, lapweld | | |
| 2-in. | 38½ | 20 |
| 2½ and 3-in. | 43½ | 25 |
| 3½ to 6-in. | 45½ | 26 |
| Steel, seamless | | |
| 2-in. | 37½ | 19 |
| 2½ and 3-in. | 41½ | 23 |
| 3½ and 6-in. | 45 | 26½ |
| Wrought Iron, lapweld | | |
| 2-in. | + 4½ | +30½ |
| 2½ to 4-in. | — 5 | +19 |
| 4½ to 6-in. | — 1 | +23½ |

Basing discounts for standard pipe are for threads and couplings. For threads only, buttweld, lapweld and seamless pipe, one point higher discount (lower price) applies. For plain ends, buttweld, lapweld and seamless pipe 3-in. and smaller, three points higher discount (lower price) applies, while for lapweld and seamless 3½-in. and larger four points higher discount (lower price) applies. F.o.b. Gary prices are one point lower discount on all buttweld. On buttweld and lapweld steel pipe, jobbers are granted a discount of 5 pct. On l.c.l. shipments, prices are determined by adding 25 pct and 30 pct and the carload freight rate to the base card.

*F.o.b. Fontana prices average 17 points lower discount (higher price) on black, 14 points on galvanized.

## BOILER TUBES

*Seamless steel and electric welded commercial boiler tubes and locomotive tubes, minimum wall. Prices per 100 ft at mill in carload lots, cut length 4 to 24 ft inclusive.*

| OD In. | Gage BWG | Seamless H.R. | Seamless C.R. | Electric Weld H.R. | Electric Weld C.D. |
|---|---|---|---|---|---|
| 2 | 13 | 19.18 | 22.56 | 18.60 | 21.89 |
| 2½ | 12 | 25.79 | 30.33 | 25.02 | 29.41 |
| 3 | 12 | 28.68 | 33.76 | 27.82 | 32.74 |
| 3½ | 11 | 35.85 | 42.20 | 34.78 | 40.94 |
| 4 | 10 | 44.51 | 52.35 | 43.17 | 50.78 |

## CAST IRON WATER PIPE

| | Per net ton |
|---|---|
| 6 to 24-in., del'd Chicago | $106.70 |
| 6 to 24-in., del'd N. Y. | 103.50 to 108.40 |
| 6 to 24-in., Birmingham | 93.50 |
| 6-in. and larger, f.o.b. cars, San Francisco, Los Angeles, for all rail shipment; rail and water shipment less | 120.30 |

Class "A" and gas pipe, $5 extra; 4-in. pipe is $5 a ton above 6-in.

## BOLTS, NUTS, RIVETS, SET SCREWS

***Consumer Prices***

*(Bolts and nuts f.o.b. mill Pittsburgh, Cleveland, Birmingham or Chicago)*

*Base discount less case lots*

### *Machine and Carriage Bolts*

| | Pct Off List |
|---|---|
| ½ in. & smaller x 6 in. & shorter | 35 |
| 9/16 & ⅝ in. x 6 in. & shorter | 37 |
| ¾ in. & larger x 6 in. & shorter | 34 |
| All diam, longer than 6 in. | 30 |
| Lag, all diam over 6 in. longer | 35 |
| Lag, all diam x 6 in. & shorter | 37 |
| Plow bolts | 47 |

### *Nuts, Cold Punched or Hot Pressed*

*(Hexagon or Square)*

| | |
|---|---|
| ½ in. and smaller | 35 |
| 9/16 to 1 in. inclusive | 34 |
| 1⅛ to 1½ in. inclusive | 32 |
| 1⅝ in. and larger | 27 |

On above bolts and nuts, excepting plow bolts, additional allowance of 15 pct for full container quantities. There is an additional 5 pct allowance for carload shipments.

### *Semifin. Hexagon Nuts*

| | USS | SAE |
|---|---|---|
| 7/16 in. and smaller | .. | 41 |
| ½ in. and smaller | 38 | .. |
| ⅝ in. through 1 in. | .. | 39 |
| 9/16 in. through 1 in. | 37 | .. |
| 1⅛ in. through 1½ in. | 35 | 37 |
| 1⅝ in. and larger | 28 | .. |

In full case lots, 15 pct additional discount.

### *Stove Bolts*

| | |
|---|---|
| Packages, nuts separate | $61.75 |
| In bulk | 70.00 |

### *Large Rivets*

*(½ in. and larger)*

| | Base per 100 lb |
|---|---|
| F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham | $6.75 |
| F.o.b. Lebanon, Pa. | 6.75 |

### *Small Rivets*

*(7/16 in. and smaller)*

| | Pct Off List |
|---|---|
| F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham | 48 |

### *Cap and Set Screws*

| *(In packages)* | Pct Off List |
|---|---|
| Hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in., SAE 1020, bright | 46 |
| ¼ to 1 in. x 6 in., SAE (1035), heat treated | 35 |
| Set screws, oval points | |
| Milled studs | 19 |
| Flat head cap screws, listed sizes | 5 |
| Fillister head cap, listed sizes | 28 |

## FLUORSPAR

Washed gravel fluorspar, f.o.b. cars, Rosiclare, Ill.

| Effective CaF, Content: | Base price per net ton |
|---|---|
| 70% or more | $37.00 |
| 60% or less | 34.00 |

## LAKE SUPERIOR ORES

*(51.50% Fe, Natural Content, Delivered Lower Lake Ports)*

| | Per Gross Ton |
|---|---|
| Old range, bessemer | $6.60 |
| Old range, nonbessemer | 6.45 |
| Mesabi, bessemer | 6.35 |
| Mesabi, nonbessemer | 6.20 |
| High phosphorus | 6.20 |

Increases or decreases in freight rates, dock handling charges and taxes after Apr. 1, 1948, are to be added to above prices.

## METAL POWDER

*Per pound, f.o.b. shipping point, in ton lots, for minus 100 mesh.*

| | |
|---|---|
| Swedish sponge iron c.i.f. New York, ocean bags | 7.9¢ to 9.0¢ |
| Domestic sponge iron, 98+% Fe, carload lots | 9.0¢ to 15.0¢ |
| Electrolytic iron, annealed, 99.5+% Fe | 19.5¢ to 39.5¢ |
| Electrolytic iron, unannealed, minus 325 mesh, 99+% Fe | 48.5¢ |
| Hydrogen reduced iron, minus 300 mesh, 98+% Fe | 63.0¢ to 80.0¢ |
| Carbonyl iron, size 5 to 10 microns, 98%, 99.8%+ Fe | 90.0¢ to $1.75 |
| Aluminum | 30.00¢ |
| Antimony | 51.17¢ |
| Brass, 10 ton lots | 27.25 to 37.25¢ |
| Copper, electrolytic | 33.625¢ |
| Copper, reduced | 34.25¢ |
| Cadmium | $2.55 |
| Chromium, electrolytic, 99% min. | $3.50 |
| Lead | 25.80¢ |
| Manganese | 55.00¢ |
| Molybdenum, 99% | $2.65 |
| Nickel, unannealed | 66.00¢ |
| Nickel, spherical, minus 30 mesh, unannealed | 68.00¢ |
| Silicon | 34.00¢ |
| Solder powder | 8.5¢ plus metal cost |
| Stainless steel, 302 | 75.0¢ |
| Tin | $1.155 |
| Tungsten, 95%, 99% | $2.90 |
| Zinc, 10 ton lots | 17.25 to 30.00¢ |

## COKE

| | Net Ton |
|---|---|
| Furnace, beehive (f.o.b. oven) Connellsville, Pa. | $14.50 to $15.50 |
| Foundry, beehive (f.o.b. oven) Connellsville, Pa. | $16.00 to $18.00 |
| Foundry, Byproduct | |
| Buffalo | $22.65 |
| Chicago, del'd | 23.90 |
| Chicago, f.o.b. | 20.85 |
| Detroit, f.o.b. | 19.40 |
| New England, del'd | 22.75 |
| Seaboard, N. J., f.o.b. | 21.50 |
| Philadelphia, f.o.b. | 20.55 |
| Swedeland, Pa., f.o.b. | 20.50 |
| Painesville, Ohio, f.o.b. | 20.90 |
| Erie, del'd | 19.95 |
| Cleveland, del'd | 22.45 |
| Cincinnati, del'd | 21.40 |
| St. Louis, del'd | 20.98 |
| Birmingham, del'd | 18.66 |

## REFRACTORIES

*(F.o.b. Works)*

| *Fire Clay Brick* | Carloads, Per 1000 |
|---|---|
| First quality, Pa., Md., Ky., Mo. (except Salina, Pa., add $5) | $80.00 |
| No. 1 Ohio | 74.00 |
| Sec. quality, Pa., Md., Ky., Mo. | 74.00 |
| No. 2 Ohio | 66.00 |
| Ground fire clay, net ton, bulk (except Salina, Pa., add $1.50) | 11.50 |
| ***Silica Brick*** | |
| Mt. Union, Pa., Ensley, Ala. | $80.00 |
| Childs, Pa. | 84.00 |
| Hays, Pa. | 85.00 |
| Chicago District | 89.00 |
| Western, Utah and Calif. | 95.00 |
| Super Duty, Hays, Pa., Athens, Tex. | 85.00 |
| Silica cement, net ton, bulk, Eastern (except Hays, Pa.) | $13.75 to 14.00 |
| Silica cement, net ton, bulk, Hays, Pa. | 16.00 |
| Silica cement, net ton, bulk, Ensley, Ala. | 15.00 |
| Silica cement, net ton, bulk, Chicago District | 14.75 |
| Silica cement, net ton, bulk, Utah and Calif. | 21.00 |
| ***Chrome Brick*** | *Per Net Ton* |
| Standard chemically bonded, Balt., Chester | $69.00 |
| ***Magnesite Brick*** | |
| Standard, Balt. and Chester | $91.00 |
| Chemically bonded, Balt. and Chester | 80.00 |
| ***Grain Magnesite*** | *Std. ⅜-in. grains* |
| Domestic, f.o.b. Balt. and Chester, in bulk, fines removed | $56.50 |
| Domestic, f.o.b. Chewelah, Wash., in bulk with fines | $30.50 to 31.00 |
| in sacks with fines | 35.00 to 35.50 |
| ***Dead Burned Dolomite*** | |
| F.o.b. producing points in Pennsylvania, West Virginia and Ohio, per net ton, bulk. Midwest, add 10¢; Missouri Valley, add 20¢ | $12.25 |

## WAREHOUSE PRICES

*Base prices, f.o.b. warehouse, per 100 lb.*
*(Metropolitan area delivery, add 15¢ to base, except New York, add 20¢)*

| CITIES | SHEETS | | | STRIP | | PLATES | SHAPES | BARS | | ALLOY BARS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Hot-Rolled | Cold-Rolled (15 gage) | Galvanized (10 gage) | Hot-Rolled | Cold-Rolled | | Standard Structural | Hot-Rolled | Cold-Finished | Hot-Rolled, A 4615 As-rolled | Hot-Rolled, A 4140-50 Ann. | Cold-Drawn, A 4615 As-rolled | Cold-Drawn, A 4140-50 Ann. |
| Philadelphia | $5.15-5.71 | $6.31-6.57 | $7.27-7.47 | $5.35-5.66 | $6.51 | $5.37-5.52 | $5.09-5.24 | $5.35-5.57 | $6.16-6.31 | $9.14 | $9.29 | $10.54 | $10.69 |
| New York | 5.40-5.98 | 6.28-6.43 | 7.25-7.73 | 5.58-5.88 | 6.48-6.73 | 5.78 | 5.32-5.58 | 5.53-5.63 | 6.18-6.38 | 9.17-9.53 | 9.32-9.68 | 10.40-10.77 | 10.55-10.92 |
| Boston | 5.48-5.64 | 6.39 | 7.56-7.69 | 5.54-5.89 | 6.75-6.79 | 5.74 | 5.39-5.54 | 5.48-5.59 | 6.24-6.34 | 9.40-9.44 | 9.55-9.59 | 10.84-10.94 | 10.92-11.09 |
| Baltimore | 5.28 | 6.18 | 7.15-7.38 | 5.34 | .... | 5.53 | 5.33-5.39 | 5.39 | 6.13 | .... | .... | .... | .... |
| Chicago | 4.85-5.10 | 5.75-5.95 | 6.95-7.05 | 4.85-5.30 | 6.15 | 5.10 | 4.90 | 4.90 | 5.70 | 9.00 | 9.15 | 10.40 | 10.55 |
| Milwaukee | 5.02-5.07 | 5.92 | 7.12-7.22 | 5.02-5.37 | 6.32 | 5.22-5.27 | 5.07 | 5.07 | 5.87 | 9.15-9.17 | 9.32 | 10.52-10.57 | 10.67-10.72 |
| Norfolk | 5.75 | .... | .... | .... | .... | 6.00 | 6.00 | 6.00 | .... | .... | .... | .... | .... |
| Cleveland | 4.98-5.20 | 5.75[1]-6.04[1] | 7.18-7.24 | 5.02-5.65 | 6.70 | 5.35-5.54 | 5.16-5.42 | 5.15-5.34 | 5.70-5.95 | 9.14-9.29 | 9.29-9.79 | 10.54 | 10.69 |
| Buffalo | 4.85-5.10 | 5.75-5.85 | 7.55-7.70 | 5.55-5.56 | 6.35 | 5.45-5.46 | 5.10 | 5.15-5.20 | 5.90-6.05 | 9.05-9.35 | 9.40-9.60 | 10.75 | 20.90 |
| Detroit | 5.20-5.55 | 6.05-6.50 | 7.45 | 5.25-5.70 | 6.25-6.55 | 5.50-5.55 | 5.30-5.37 | 5.30-5.52 | 6.02-6.07 | 9.31-9.55 | 9.20-9.47 | 10.72-10.95 | 10.87-11.10 |
| Cincinnati | 5.14-5.36[8] | 5.82-6.21[8] | 6.97-7.45 | 5.25-5.62[8] | 6.31 | 5.50-5.71[8] | 5.30-5.47[8] | 5.30-5.62[8] | 6.06-6.17[8] | 9.31-9.35 | 9.50-9.51 | 10.75-10.76 | 10.90-10.91 |
| St. Louis | 5.19 | 6.04-6.09 | 7.29-7.39 | 5.19-5.79 | 6.49 | 5.39-5.44 | 5.24 | 5.24 | 6.04 | 9.34 | 9.49 | 10.74 | 10.89 |
| Pittsburgh | 4.85-4.90 | 5.75[1] | 6.95-7.05 | 5.00-5.35 | 5.95 | 5.05-5.25 | 4.90-5.15 | 4.90-5.10 | 5.65-5.80 | 9.00 | 9.15 | 10.40 | 10.55-10.80 |
| St. Paul | 5.41 | 6.31 | 7.30-7.61 | 5.41 | .... | 5.66 | 5.46 | 5.46 | 6.26 | 9.56 | 9.71 | 10.96 | 11.11 |
| Omaha | 5.92 | .... | 9.18 | 5.92 | .... | 6.17 | 5.97 | 5.97 | 6.77 | .... | .... | .... | .... |
| Birmingham | 5.05[1] | 6.36 | 6.45 | 5.05[11] | 6.36 | 5.25[11] | 5.00[11] | 5.00[11] | 6.51 | .... | .... | .... | .... |
| Houston | 6.40 | .... | 8.80 | 6.75 | .... | 6.35 | 6.20 | 6.40 | 7.60 | 9.80 | 9.65 | 10.75 | 10.95 |
| Los Angeles | 6.30-6.40 | 7.85[1]-7.90 | 7.95-8.55 | 6.60-6.66 | 9.35[5] | 5.95-6.10 | 5.75-5.90 | 6.05 | 7.85[15]-7.95 | 10.35[15] | 10.20[15] | 11.75[15] | 11.95[15] |
| San Francisco | 5.95[8] | 7.15[2] | 8.05-8.55[2] | 6.75[8] | 8.25 | 6.30-7.68[8] | 5.90-6.90 | 5.90 | 7.55 | 10.35[15] | 10.20[15] | 11.75[15] | 11.95[15] |
| Portland | 6.50[4] | 8.00[2] | 8.15[2]-8.45[2] | 6.85[4] | .... | 6.30[4] | 6.25[4] | 6.25[4] | 8.25[4] | .... | 10.45[15] | .... | 12.05[15] |
| Seattle | 6.20[4]-6.30[4] | 7.75[2]-7.85[2] | 7.65-8.00 | 6.55[4]-6.65[4] | .... | 6.20-6.30 | 6.15-6.25 | 6.05[4]-6.15[4] | 8.00[14]-8.10[14] | .... | 10.30[15]-10.40[15] | .... | 12.00[15]-12.05[15] |
| Salt Lake City | 6.15-8.00 | 7.35 | 7.90-9.06 | 7.10-7.45 | .... | 5.75-6.65 | 6.65-7.00 | 6.95-7.25 | 7.55-8.40 | .... | .... | .... | .... |

## BASE QUANTITIES

*Standard unless otherwise keyed on prices.*

**HOT-ROLLED:** Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

**COLD-ROLLED:** Sheets, 400 to 1999 lb; strip, extras on all quantities bars 1000 lb and over.

**ALLOY BARS:** 1000 to 1999 lb.

**GALVANIZED SHEETS:** 450 to 1499 lb.

**EXCEPTIONS:** (1) 400 to 1499 lb; (2) 450 to 1499 lb; (3) 300 to 4999 lb; (4) 300 to 9999 lb; (5) 2000 lb and over; (6) 1000 lb and over; (7) 400 to 14,999 lb; (8) 400 lb and over; (9) 500 to 1999 lb; (10) 500 to 999 lb; (11) 400 to 3999 lb; (12) 450 to 3749 lb; (13) 400 to 1999 lb; (14) 1500 lb and over; (15) 1000 to 4999 lb; (16) 4000 lb and over; (17) up to 1999 lb.

## PIG IRON PRICES

*Dollars per gross ton. Delivered prices represent minimums. Delivered prices do not include 3 pct tax on freight.*

**PRODUCING POINT PRICES**

| Producing Point | Basic | No. 2 Foundry | Malleable | Bessemer | Low Phos. |
|---|---|---|---|---|---|
| Bethlehem | 48.00 | .... | .... | .... | .... |
| Birmingham | 42.88 | 43.38 | .... | .... | .... |
| Buffalo | 47.00-48.00* | 47.00-48.00* | 47.50-48.50* | .... | .... |
| Chicago | 46.00 | 46.00 | 46.50 | 47.00 | .... |
| Cleveland | 46.00 | 46.50 | 46.50 | 47.00 | 51.00 |
| Duluth | 46.00 | 46.00 | 46.50 | 47.00 | .... |
| Erie | 45.50 | 46.00 | 46.50 | 47.00 | .... |
| Everett | .... | 48.75 | 49.25 | .... | .... |
| Granite City | 47.90 | 48.40 | 48.90 | .... | .... |
| Neville Island | 46.00 | 46.50 | 46.50 | .... | .... |
| Provo | 46.00 | 46.50 | .... | .... | .... |
| Sharpsville | 46.00 | 46.50 | 46.50 | 47.00 | .... |
| Steelton | 48.00 | 48.50 | 49.00 | 49.50 | 54.00 |
| Struthers, Ohio | 46.00 | .... | .... | .... | .... |
| Swedeland | 50.00 | 50.50 | 51.00 | 51.50 | .... |
| Toledo | 45.50 | 46.00 | 46.50 | 47.00 | .... |
| Troy, N. Y. | .... | .... | .... | .... | 54.00 |
| Youngstown | 46.00 | 46.50 | 46.50 | .... | .... |

**DELIVERED PRICES† (BASE GRADES)**

| Consuming Point | Producing Point | Freight Rate | Basic | No. 2 Foundry | Malleable | Bessemer | Low Phos. |
|---|---|---|---|---|---|---|---|
| Boston | Everett | $0.50 Arb. | .... | 48.75 | 49.25 | .... | .... |
| Boston | Steelton | 6.27 | 54.27 | 54.77 | 55.27 | 55.77 | 60.27 |
| Brooklyn | Bethlehem | 3.90 | 51.90 | .... | .... | .... | .... |
| Cincinnati | Birmingham | 6.09 | 48.97 | 49.47 | .... | .... | .... |
| Jersey City | Bethlehem | 2.39 | 50.39 | .... | .... | .... | .... |
| Los Angeles | Provo | 6.93 | 52.93 | 53.43 | .... | .... | .... |
| Mansfield | Cleveland-Toledo | 3.03 | 49.03-48.53 | 49.53-49.03 | 49.53 | 50.03 | 54.03 |
| Philadelphia | Bethlehem | 2.21 | 50.21 | .... | .... | .... | .... |
| Philadelphia | Swedeland | 1.31 | 51.31 | 51.81 | 52.31 | 52.81 | .... |
| Philadelphia | Steelton | 2.81 | 50.81 | 51.31 | 51.81 | 52.31 | 56.81 |
| San Francisco | Provo | 6.93 | 52.93 | 53.43 | .... | .... | .... |
| Seattle | Provo | 6.93 | 52.93 | 53.43 | .... | .... | .... |
| St. Louis | Granite City | 0.75 Arb. | 48.65 | 49.15 | 49.65 | .... | .... |

* Republic Steel Corp. price: Basis: pig iron at Buffalo set by average price of No. 1 hvy. mlt. steel scrap at Buffalo as shown in last week's issue of THE IRON AGE. Price is effective until next Sunday midnight.

Producing point prices are subject to switching charges; silicon differential (not to exceed 50¢ per ton for each 0.25 pct silicon content in excess of base grade which is 1.75 to 2.25 pct); phosphorus differentials, a reduction of 38¢ per ton for phosphorus content of 0.70 pct and over; manganese differentials, a charge not to exceed 50¢ per ton for each 0.50 pct manganese content in excess of 1.00 pct. $2 per ton extra may be charged for 0.5 to 0.75 pct nickel content and $1 per ton extra for each additional 0.25 pct nickel.

Silvery iron (blast furnace) silicon 6.00 to 6.50 pct. C/L per g.t., f.o.b. Jackson, Ohio —$56.50; f.o.b. Buffalo $60.75. Add $1.25 per ton for each additional 0.50 pct Si. up to 12 pct. Add 50¢ per ton for each 0.50 pct Mn over 1.00 pct. Add $1.00 per ton for 0.75 pct or more P. Bessemer ferrosilicon prices are $1.00 per ton above silvery iron prices of comparable analysis.

Charcoal pig iron base price for low phosphorus $66.00 per gross ton, f.o.b. Lyles, Tenn. Delivered Chicago, $73.78. High phosphorus charcoal pig iron is not being produced.

### *Ferromanganese*

78-82% Mn, Maximum contract base price, gross ton, lump size.

F.o.b. Birmingham ..... $162
F.o.b. Niagara Falls, Alloy, W. Va., Welland, Ont. ..... $160
F.o.b. Johnstown, Pa. ..... $162
F.o.b. Sheridan, Pa. ..... $160
F.o.b. Rockwood, Tenn. ..... $165
Fo.b. Etna, Pa. ..... $163

$2.00 for each 1% above 82% Mn; penalty, $1.30 for each 1% below 78%.

Briquets—Cents per pound of briquet, delivered, 66% contained Mn.

| | |
|---|---|
| Carload, bulk | 10.0 |
| Ton lots | 11.6 |
| Less ton lots | 12.5 |

### *Spiegeleisen*

Contract prices, gross ton, lump, f.o.b.

| | 16-19% Mn 3% max. Si | 19-21% Mn 3% max. Si |
|---|---|---|
| Palmerton, Pa. | $61.00 | $62.00 |
| Pgh. or Chicago | 65.00 | 66.00 |

### *Manganese Metal*

Contract basis, 2 in. x down, cents per pound of metal, delivered.

96% min. Mn, 0.2% max. C, 1% max. Si, 2% max. Fe.

| | |
|---|---|
| Carload, packed | 35.5 |
| Ton lots | 37.0 |

### *Electrolytic Manganese*

F.o.b. Knoxville, Tenn., freight allowed east of Mississippi, cents per pound.

| | |
|---|---|
| Carloads | 32 |
| Ton lots | 34 |
| Less ton lots | 36 |

### *Low-Carbon Ferromanganese*

Contract price, cents per pound Mn contained, lump size, delivered.

| | Carloads | Ton | Less |
|---|---|---|---|
| 0.07% max. C, 0.06% P, 90% Mn. | 25.25 | 27.10 | 28.30 |
| 0.10% max. C | 24.75 | 26.60 | 27.80 |
| 0.15% max. C | 24.25 | 26.10 | 27.30 |
| 0.30% max. C | 23.75 | 25.60 | 26.80 |
| 0.50% max. C | 23.25 | 25.10 | 26.30 |
| 0.75% max. C, 7.00% max. Si | 20.25 | 22.10 | 23.30 |

### *Silicomanganese*

Contract basis, lump size, cents per pound of metal, delivered, 65-68% Mn, 18-20% Si, 1.5% max. C.

| | |
|---|---|
| Carload bulk | 8.60 |
| Ton lots | 10.25 |
| Briquet, contract basis, carlots, bulk delivered, per lb of briquet | 10.0 |
| Ton lots | 11.6 |
| Less ton lots | 12.5 |

### *Silvery Iron (electric furnace)*

Si 14.01 to 14.50 pct., f.o.b. Keokuk, Iowa, openhearth $81.00, foundry, $82.00; $81.75 f.o.b. Niagara Falls; Electric furnace silvery iron is not being produced at Jackson. Add $1.00 per ton for each additional 0.50% Si up to and including 18%. Add $1.00 for each 0.50 pct Mn over 1 pct.

### *Silicon Metal*

Contract price, cents per pound contained Si, lump size, delivered, for ton lots packed.

| | |
|---|---|
| 96% Si, 2% Fe | 20.70 |
| 97% Si, 1% Fe | 21.10 |

### *Silicon Briquets*

Contract price, cents per pound of briquet, bulk, delivered, 40% Si, 1 lb Si briquets.

| | |
|---|---|
| Carload, bulk | 5.90 |
| Ton lots | 7.50 |
| Less ton lots | 8.40 |

### *Electric Ferrosilicon*

Contract price, cents per pound contained Si, lump size, bulk, in carloads, delivered.

| | |
|---|---|
| 25% Si | 17.50 |
| 50% Si | 10.50 |
| 75% Si | 13.00 |
| 85% Si | 14.65 |
| 90-95% Si | 16.50 |

### *Calcium Metal*

Eastern zone contract prices, cents per pound of metal, delivered.

| | Cast Turnings | | Distilled |
|---|---|---|---|
| Ton lots | $2.05 | $2.95 | $3.75 |
| Less ton lots | 2.40 | 3.30 | 4.55 |

### *Ferrochrome* (65-72% Cr, 2% max. Si)

Contract prices, cents per pound, contained Cr, lump size, bulk, in carloads, delivered.

| | |
|---|---|
| 0.06% C | 28.75 |
| 0.10% C | 28.25 |
| 0.15% C | 28.00 |
| 0.20% C | 27.75 |
| 0.50% C | 27.50 |
| 1.00% C | 27.25 |
| 2.00% C | 27.00 |
| 65-69% Cr, 4-9% C | 20.50 |
| 62-66% Cr, 4-6% C, 6-9% Si | 21.35 |

Briquets — Contract price, cents per pound of briquet, delivered, 60% chromium.

| | |
|---|---|
| Carload, bulk | 13.75 |
| Ton lots | 15.25 |
| Less ton lots | 16.15 |

### *High-Nitrogen Ferrochrome*

Low-carbon type: 67-72% Cr, 0.75% N. Add 5¢ per lb to regular low carbon ferrochrome price schedule. Add 5¢ for each additional 0.25% N.

### *S. M. Ferrochrome*

Contract price, cents per pound chromium contained, lump size, delivered.

High carbon type: 60-65% Cr, 4-6% Si, 4-6% Mn, 4-6% C.

| | |
|---|---|
| Carload | 21.60 |
| Ton lots | 23.75 |
| Less ton lots | 25.25 |

Low carbon type: 62-66% Cr, 4-6% Si, 4-6% Mn, 1.25% max. C.

| | |
|---|---|
| Carload | 27.75 |
| Ton lots | 30.05 |
| Less ton lots | 31.85 |

### *Chromium Metal*

Contract prices, cents per lb. chromium contained packed, delivered, ton lots. 97% min. Cr. 1% max. Fe.

| | |
|---|---|
| 0.20% max. C | 1.09 |
| 0.50% max. C | 1.05 |
| 9.00% min. C | 1.04 |

### *Calcium—Silicon*

Contract price per lb of alloy, lump, delivered.

30-33% Ca, 60-65% Si, 3.00% max. Fe.

| | |
|---|---|
| Carloads | 17.90 |
| Ton lots | 21.00 |
| Less ton lots | 22.50 |

### *Calcium—Manganese—Silicon*

Contract prices, cents per lb of alloy, lump, delivered.

16-20% Ca, 14-18% Mn, 53-59% Si

| | |
|---|---|
| Carloads | 19.25 |
| Ton lots | 21.55 |
| Less ton lots | 22.55 |

### *CMSZ*

Contract price, cents per pound of alloy, delivered.

Alloy 4: 45-49% Cr, 4-6% Mn, 18-21% Si, 1.25-1.75% Zr, 3.00-4.5% C.

Alloy 5: 50-56% Cr, 4-6% Mn, 13.50-16.00% Si, 0.75 to 1.25% Zr, 3.50-5.00% C.

| | |
|---|---|
| Ton lots | 19.75 |
| Less ton lots | 21.00 |

### *V Foundry Alloys*

Cents per pound of alloy, f.o.b. Suspension Bridge, N. Y., freight allowed; max. St. Louis. V-5: 38-42% Cr, 17-19% Si, 8-11% Mn. V-7: 28-32% Cr, 15-21% Si, 14-16% Mn.

| | |
|---|---|
| Ton lots | 15.75¢ |
| Less ton lots | 17.00¢ |

### *Graphidox No. 4*

Cents per pound of alloy, f.o.b. Suspension Bridge, N. Y., freight allowed, max. St. Louis. Si 56%, Ti 9%, Ca 5%.

| | |
|---|---|
| Ton lots and carload packed | 18.00¢ |
| Less ton lots | 19.50¢ |

### *SMZ*

Contract price, cents per pound of alloy, delivered. 60-65% Si, 5-7% Mn, 5-7% Zr, 20% Fe, ½ in. x 12 mesh.

| | |
|---|---|
| Ton lots | 17.25 |
| Less ton lots | 18.50 |

### *Other Ferroalloys*

| | |
|---|---|
| Ferrotungsten, standard, lump or ¼ x down, packed, per pound contained W, 5 ton lots, delivered | $2.25 |
| Ferrovanadium, 35-55%, contract basis, delivered, per pound, contained, V. | |
| Openhearth | $2.90 |
| Crucible | 3.00 |
| High speed steel (Primos) | 3.10 |
| Vanadium pentoxide, 88-92% $V_2O_5$ contract basis, per pound Contained $V_2O_5$ | $1.20 |
| Ferrocolumbium, 50-60% contract basis, delivered, per pound contained Cb. | |
| Ton lots | $2.75 |
| Less ton lots | $2.80 |
| Ferromolybdenum, 55-75%, f.o.b. Langeloth, Washington, Pa., per pound contained Mo. | 95¢ |
| Calcium molybdate, 45-50%, f.o.b. Langeloth, Washington, Pa., per pound contained Mo. | 80¢ |
| Molybdenum oxide briquets, f.o.b. Langeloth and Washington, Pa., per pound contained Mo. | 80¢ |
| Molybdenum oxide in bags, f.o.b. Langeloth and Washington, Pa., per pound contained Mo. | 80¢ |
| Ferrotitanium, 40-45%, 0.10% C max., f.o.b. Niagara Falls, N. Y., ton lots, per pound contained Ti | $1.23 |
| Ferrotitanium, 20-25%, 0.10% C max., ton lots, per pound contained Ti | $1.35 |
| Less ton lots | 1.40 |
| High carbon ferrotitanium, 15-20%, 6-8% C, contract basis, f.o.b. Niagara Falls, freight allowed, carloads, per net ton | $160.00 |
| Ferrophosphorus, electrolytic, 23-26%, carlots, f.o.b. Siglo, Mt. Pleasant, Tenn., $3 unitage, per gross ton | $65.00 |
| 10 tons to less carload | 75.00 |
| Zirconium, 35-40%, contract basis, f.o.b. plant, freight allowed, per pound of alloy. | |
| Ton lots | 21.00¢ |
| Zirconium, 12-15%, contract basis, lump, delivered, per pound of alloy. | |
| Carload, bulk | 6.60¢ |
| Alsifer, 20% Al, 40% Si, 40% Fe, contract basis, f.o.b. Suspension Bridge, N. Y. | |
| Carload | 8.40¢ |
| Ton lots | 9.30¢ |
| Simanal, 20% Si, 20% Mn, 20% Al, contract basis, f.o.b. Philo, Ohio, freight allowed, per pound | |
| Carload, bulk | 11.00 |
| Ton lots, packed | 11.75 |

### *Boron Agents*

Contract prices per pound of alloy, delivered.

| | |
|---|---|
| Ferroboron, 17.50% min. B, 1.50% max. Si, 0.50% max. Al, 0.50% max. C, 1 in. X D. | |
| Ton lot | $1.20 |
| Manganese—Boron 75.00% Mn. 15-20% B, 5% max. Fe, 1.50% max. Si, 3.00% max. C, 2 in. X D, delivered. | |
| Ton lots | $1.67 |
| Less ton lots | 1.79 |
| Nickel—Boron 15-18% B, 1.00% max. Al, 1.50% max. Si, 0.50% max. C, 3.00% max. Fe, balance Ni, delivered. | |
| Less ton lots | $1.80 |
| Silcaz, contract basis, delivered. | |
| Ton lots | 45.00¢ |
| Grainal, f.o.b. Bridgeville, Pa., freight allowed, 100 lb and over. | |
| No. 1 | 93¢ |
| No. 6 | 63¢ |
| No. 79 | 45¢ |
| Bortam, f.o.b. Niagara Falls | |
| Ton lots, per pound | 45¢ |
| Less ton lots, per pound | 50¢ |
| Carbortam, f.o.b. Suspension Bridge, N. Y., freight allowed. Ti 15-18%, B 1.00-1.50%, Si 2.5-3.0%, Al 1.0-2.0%. | |
| Ton lots, per pound | 8.625¢ |
| Borosil, f.o.b. Philo, Ohio, freight allowed, B 3-4%, Si 40-45%, per lb contained B | $6.25 |

## Alloy Steel Industry

(CONTINUED FROM PAGE 154)

chief metallurgist of the Spicer Mfg. Co. A little later in cooperation with E. O. Mann of Chevrolet Motors, the Carnegie-Illinois Steel Corp. developed the present low chromium-nickel 3000 series steels and a low chromium-nickel-molybdenum then referred to as 4200 series. This grade was also developed by the Carnegie-Illinois Steel Corp. for the Saginaw Steering Gear Div. of General Motors.

Late in the thirties the subject of hardenability began to emerge and be understood. About 1937, Jominy and Boegehold came through with the hardenability test, now called the end-quench test, which is a standard for the industry. During this same period Dr. Bain and E. S. Davenport reported their basic research on the decomposition of austenite which were first called S curves and are now more popularly known as TTT diagrams. In 1942 Dr. Grossman of Carnegie-Illinois Steel made public his classic study on the calculation of hardenability from chemical composition.

Between 1935 and 1940 strenuous efforts were made to standardize constructional alloy steels. The American Iron & Steel Institute, in a study of the possibilities of standardization based upon significance by tonnage, reduced some 4000 alloy steel specifications to about 100 standard alloy steel types. The Society of Automotive Engineers and the American Iron & Steel Institute pooled their resources and through compromises and agreements, the alloy steel producing industry was put on a much sounder and more practical basis through this standardization program.

This work was not long completed when World War II brought about a high demand and still newer alloys became necessary. That problem was not a matter of personal opinion as to which steel should be used, but purely a matter of how far the virgin metallics, which were in scarce supply, could be stretched to meet the metallurgical requirements and mounting tonnage production. National Emergency steels of the low chromium-nickel-molybdenum compositions were adopted practically overnight but were based on the long hard years of trial and error and experience that preceded this period.